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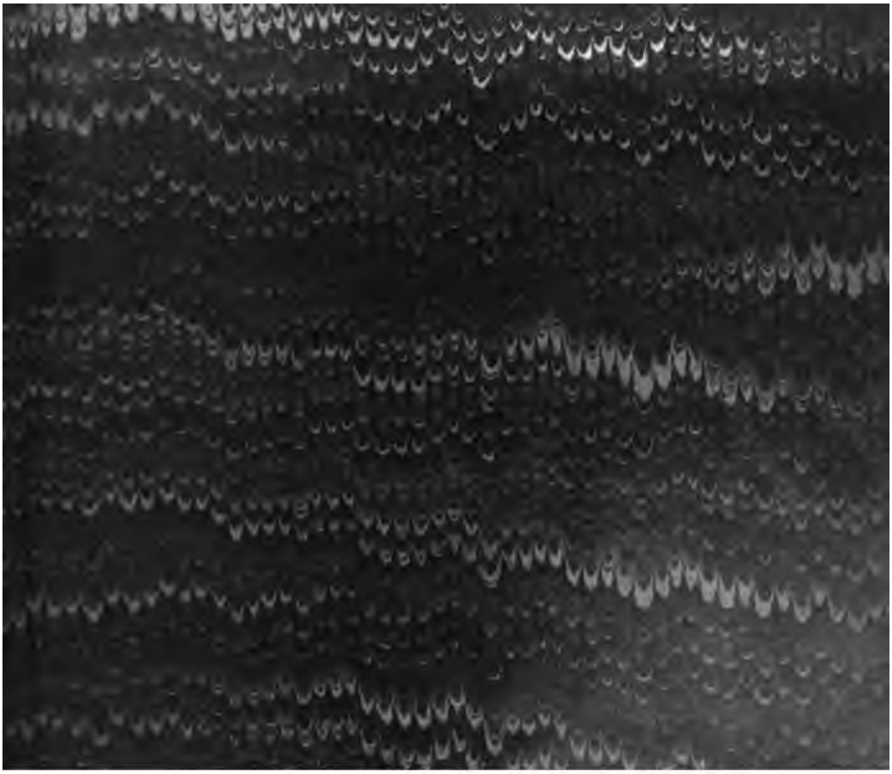

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# PAPERS AND PROCEEDINGS,

AND

# REPORT,

OF THE

# ROYAL SOCIETY

OF

# TASMANIA,

FOR

# 1881.

*TASMANIA:*
*PRINTED AT THE "MERCURY"* STEAM PRESS OFFICE, HOBART.
*1882.*

THE responsibility of the statements and opinions given in the following papers, and discussions, rests with the individual authors: the Society as a body merely places them on record.

Ford-Messer
Thin
8-5-24
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# PROCEEDINGS.

## APRIL, 1881.

A monthly evening meeting of the Society, the first of the present session, was held on Tuesday, the 12th April, His Excellency Sir John Henry Lefroy, K.C.M.G., F.R.S., the President, in the chair.

Mr. Bernard Shaw, who had previously been nominated by the Council, was balloted for, and declared duly elected as a Fellow of the Society.

The Honorary Secretary (Mr. Barnard) brought forward the usual returns, viz.:—

1. Number of visitors to Museum during March—On Sundays, 558; on week days, 940; total, 1,498.
2. Ditto to Gardens, total 4,293.
3. Plants and seeds received at Gardens, March.
4. Books and Periodicals received.
5. Presentations to Museum.

*Meteorological Returns.*

1. From the Hobart Marine Board. Tables from Bruni Island Lighthouse for January, February, and March; Swan Island for ditto; Goose Island for January; King's Island for ditto; and Kent's Group for ditto.
2. From Mr. D. C. Purdy, observations taken at Macquarie Harbour during January and February.
3. From Mr. Roblin. Tables of Results of Meteorological Observations taken at the Lighthouses, etc., on Tasmanian Coasts during 1880, compiled from monthly returns furnished by the Hobart Marine Board.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during January, February, and March:—

January 10. Veronica angustifolia in full flower.
,, 12. Jargonelle Pear ripe.
,, 14. Moore Park Apricot ripe.
,, 22. Grevillea robusta in full flower.
,, 28. Black Mulberry commencing to ripen.
February 8. Kerry pippin Apple commencing to ripen.
,, 14. Windsor Pear do. do.
,, 17. Bon Chretien Pear do. do.
,, 18. Greengage Plum do. do.
,, 27. Ash commencing to shed seed.
,, 28. Sycamore do.
March 6. Seckle Pear commencing to ripen.
,, 8. Tips of Hornbeam turning brown.
,, 10. Coe's Golden Drop Plum ripe.
,, 16. Tips of Elm turning yellow.
,, 18. Horsechestnut leaves turning brown.
,, 24. Ash leaves commencing to fall.
,, 27. Oak leaves do. do.

The presentations to the Museum were as follow:—

1. From Mr. A. K. Johnston, Townsville, North Queensland. Specimen of Sponge from the Great Barrier Reef. Two bottles containing Lizards, Centipedes, etc., from Etheridge River. Shell of Freshwater Tortoise. Two Boomerangs made by natives of North Queensland.

2. From Mr. Robert Henry. Skeleton of a Wombat from a sandbank near Low Heads.
[These bones were exposed by the action of the wind cutting through the sandbank, which must have been at least 25ft. high where it covered them.]
3. From Mr. Wm. Tarleton. Bones of recent Marsupial Animals, etc., from a calcareous deposit on Kent's Group, Bass' Straits.
[The bones were found in a cavity 50ft. in depth, washed out by floods, and situated 600ft. above sea level.] Specimens of *Helix Simsoniana* from the same locality.
4. From Mr. J. Moore. Fragments of bone, teeth, etc., from a Tertiary deposit, exposed by blasting at the Alexandra Battery, One-Tree Point. [These specimens are referred to in Mr. Johnston's paper, on the condition of the Estuary of the Derwent during the tertiary period, read at the same meeting.]
5. From Mr. H. Wright, Glenorchy. Head of Pelican *(Pelecanus conspicillatus)* from George's Bay.
6. From His Excellency Sir F. A. Weld, K.C.M.G. A collection of Bird Skins (14), and three nests of Weaver Bird *(Ploceus baya)* from Singapore.
7. From Captain Boon, barque Mary Blair. Fragment of an earthen vessel from the ruins of the Castle of Henry IV., at Dieppe, France. Specimen of Granite broken from Cleopatra's Needle.
8. From Mr. Finlayson. A Modern Greek Copper Coin.
9. From Mr. G. A. Power, Ross. Specimen of "Native Bread" *(Mylitta Australis)*, which, when fresh, weighed 25lbs.
10. From Mr. Ormond FitzGerald. A White Hawk *(Leucospiza Novæ Hollandiæ)*.
11. A collection of British Birds' Eggs, from Mr. W. R. Stephens.

[Mr. E. D. Swan drew attention to this valuable donation. The collection contains more than 500 eggs and about 150 species, many of them of rare occurrence in the British Isles. As they were all procured by Mr. Stephens himself, the various specimens can be properly identified. Should, as has often been proposed, the introduction of many of the English birds into this colony be carried out, some legislation for their protection, especially during the breeding season, would be necessary. This collection would then be of very great use in making the eggs of the protected birds familiar.]

12. From Mr. S. H. Wintle. A sample of the so-called Mineral Wax *(Zietrisikite*, Dana) from Utah, America. Section of Pepper Tree *(Drimys aromatica)* from George's Bay. Specimens of Sandstone and Slate in contact with Granite, from George's Bay.

[In reference to this presentation, Mr. Wintle remarks:—"For a long time the question of the age of the granite so extensively developed in the stanniferous districts of the North-east Coast of this island has been one of much interest for me. My efforts to obtain a clue to that age had been unrewarded till about three years ago, when, near the head of the Scamander River, I picked up a specimen of slate in contact with granite. (See specimen No. 1.) Not succeeding in finding the parent rocks in contact, I had to be content to wait till I could obtain further evidence of what I conceived to be the facts of the case, viz., that the granite of this region was eruptive, and consequently of more recent age than the associated sedimentary rocks of older palæozoic date. The missing link in the geological chain was supplied about six months ago, through blasting operations being carried on in the creek of the Saxelby tin claim, seven miles from George's Bay. Here, then, was brought to light the further evidence required to support the conclusions at which I had arrived from an examination of No. 1 specimen, in obtaining the granite in contact with sandstone transmuted more or less at the point of contact. (See specimen No. 2.) In No. 1 specimen it will be seen that the slate has been altered to no small extent by the granite, and that there has been an interchange of particles as though the slate had been rendered soft or plastic by the heat of the eruptive rock under great pressure; while in No. 2 specimens the sandstone has been changed at the point of contact into quartzite by fusion of the silicious particles, the result of the same agency. In the Ringarooma district, I have since found examples of the same character, *i e.*, granite with altered sandstone attached. Here, then, is to be seen good evidence of the granite being of later origin than the stratified formations associated with it. But there is no evidence, that I have seen, of the precise geologic age during which the granite made its appearance, nor have I succeeded in discovering any palæontological remains in the sedimentary rocks of the districts in question that would enable the geologist to decide whether they were either upper or lower Silurian or still older Cambrian systems. In New South Wales there are Devonian granites, according to the late Rev. W. B. Clarke, if I quote that geologist correctly, and as there is much in common with the Tasmanian formations, it is not unlikely the granite under consideration may be referable to the same epoch. This granite having burst through and displaced the older palæozoic strata, has in turn been erupted by the greenstone and basalt. Striking examples of this are to be seen in the Fingal district, where greenstone caps the granite, while in most of the higher hills in the vicinity of Thomas' Plains basalt is the capping rock of the granite. Precisely the same conditions obtain at Mount Bischoff of the granite erupting, displacing, and altering at point of contact the older palæozoic sedimentary formations; and when other analogous conditions are taken into consideration, it is quite possible that the granitoid formations of that part of the island owe their origin to the same period as these of the East Coast."]

13. From the Rev. George Brown, Sydney. Two carved wooden Masks, worn by the Natives of New Ireland in their dances.
14. *a* From Mr. James Barnard. A miniature Silver Medal, struck at the Mint in commemoration of the Melbourne Exhibition, having the words " Melbourne International Exhibition, MDCCCLXXX," encircling the Queen's Head, and on the obverse the motto "Vitam excoluere per artes."
    *b* Sample of Victorian Coal from Cape Patterson, 80 miles from Melbourne, taken from the "Queen Seam," 4ft. thick. Distant 18 miles from the shipping place. With a printed description and opinions of the Press. From Mr. J. S. Butters, Melbourne.
    *c* Coloured view of the Island of Ovalau and the Town of Levuka, Fiji. From the same gentleman.
    *d* Sample of Alluvial Tin, from Aberfoyle, Avoca, received from Mr. F. A. Padfield, Campbell Town.
    *e* Sample of Tin Stone from the lode of the Great Extended Pieman River Co. From the same gentleman.
15. From Mrs. W. Murray. Specimen of the Indian Minah *(Acridotheres tristis)*, prepared and mounted.
16. From Mr. E. D. Swan. Specimen of Shell *(Cassis rufa)*, with cameo cutting.
17. From Mr. James Simpson. Four Granite boulders, remarkable for their almost perfectly spherical form, from Thomas' Plains.
18. From Mr. Wm. Exton, Oatlands. Specimen of the Grey Flying Opossum *(Belideus sciurus)*.
19. From Dr. Macfarlane, New Norfolk. Specimen of the Australian Crane *(Grus Australasianus)*.
20. From Mr. W. H. Burgess, M.H.A. Specimens of Auriferous

Quartz from the "New Chum," "West Chum," and "Golden Era" companies claims, Lefroy; and Tasmania Co., Beaconsfield. Tin ore from Cumberland Co., West Coast; and from Ben Lomond Co., Ben Lomond.

21. From Mr. C. C. Nairn. Specimen of Fossil Wood, from railway cutting, Jerusalem.
22. From Masters G. Stewart and B. Edwards. Nests and Eggs of Tasmanian Birds.
23. From Mr. R. B. Sheridan, Maryborough, Queensland. Specimen of the peculiar fish, *Ceratodus Forsteri*, from the Burnett River.
24. From Mr. Terry, Lachlan, New Norfolk. A Cormorant *(Phalacrocorax carboides)*, unusually marked.
25. From His Excellency Lieut.-General Sir J. H. Lefroy, C.B., K.C.M.G., F.R.S. A handsomely framed portrait of Admiral Sir James Ross, R.N. Also, a specimen of a fossil *(Sanquinolites Etheridgei?)* from the excavation at the New Battery, Kangaroo Point.
27. From Mr. T. Stephens. Specimen of *Eucalyptus cordata*.

[In reference to specimens of *Eucalyptus cordata*, which had been forwarded to the Museum by Mr. Richard Hill, of Hospital Bay, and were on the table for the inspection of the Fellows, Mr. STEPHENS remarked that this interesting tree, discovered and described long ago, had been lost to sight for more than forty years. It was originally reported as a denizen of Recherche Bay by the French expedition under Labillardière; and long afterwards, in Sir John Franklin's time, it was found by Sir Joseph Hooker and the late Mr. Ronald Gunn "in the Huon district," no precise locality having been recorded. From that time to the present it appears to have eluded the search of botanists; and it was only in October last that, in answer to repeated enquiries, specimens were at last obtained from Recherche Bay, but without flower or fruit. A few weeks later it was found by Mr. Hill, on the Huon road, probably on the same spot where it was last seen.] Shortly after the date of this communication *Eucalyptus cordata* was found by Mr. Stephens and Mr. Abbott on the foot hills of Mount Wellington near the Huon road, within five miles of Hobart.

28. From Mr. C. E. Beddome. Specimens of two new Marine Shells *(Delphinula Johnstoni, and Leda Lefroyi)*, dredged off Three Hut Point, D'Entrecasteaux Channel, with descriptive notes.

Mr. STEPHENS said that the Royal Society could not meet for the first time since the death of the late Mr. Ronald Gunn without paying a passing tribute (a more formal record being reserved for a future occasion) to the memory of one whose name was intimately associated with its earliest history. From the time of his arrival Mr. Gunn's name appears associated with every early attempt to cultivate a knowledge of the natural products and resources of the colony: in the department of Botany he was one of the first pioneers, and for many years stood almost alone. As a genial and kindly companion and friend, ready at all times to place his stores of general and special information at the service of any one interested in his favourite studies, he would long be remembered by those who had, if only for a brief period, the advantage of his acquaintance; while as an explorer of some of the wildest parts of Tasmania, at a time when settlement in the north-western and western districts had not yet begun, he had rendered important service to the colony, and had had few to rival him since for indomitable energy and fertility of resources. As one of the founders of the Royal Society his name would always be held in honour in this place.

*His EXCELLENCY*, the President, then read the opening address.

*Mr. R. M. JOHNSTON*, F.L.S., read an elaborate and carefully prepared paper, illustrated by coloured diagrams and a map, entitled "Notes showing that the existing Estuary of the Derwent was occupied by a Fresh-water Lake during the Tertiary Period."

The **President** having invited an expression of opinion on the subject of Mr. Johnston's paper, Mr. **Stephens** said that if there appeared to be any hesitation on the part of members present in volunteering remarks, it was not caused by any want of appreciation of the admirable paper which had just been read, but rather by the evident impossibility of properly discussing the numerous questions of interest which had been brought forward. The formation so fully described by the author of the paper had frequently been brought under the notice of the Fellows in former years, and, among others by one whose presence at their meetings would long be missed, the late Mr. Morton Allport, who was intimately acquainted with the surrounding district; but these had been chiefly conversational discussions, of which no record had been preserved, and the Society was greatly indebted to Mr. Johnston for having presented in a concrete form so much interesting matter for future study and consideration. He (Mr. Stephens) was inclined to regard the tertiary deposits in the lower part of the Derwent basin rather as of estuarine and fluviatile origin, with land springs, which he thought were the chief agents in the formation of the beds of travertin at Risdon, and in the suburbs of Hobart, and by the process which is still going on in the formation of similar deposits in various parts of the island. Of the existence of a series of lakes in past times, far up the valley of the Derwent, which had been successively drained by erosion, and had exposed the remains of tertiary beds in the ancient valleys, there could be no doubt. These lakes indeed belonged to a later age, but there was nothing at present known which could invalidate the general conclusion so carefully stated by Mr. Johnston.

A vote of thanks to His Excellency for his opening address, and to the authors of the papers read, as well as to the various contributors to the Museum, closed the proceedings of the meeting.

## MAY, 1881.

The monthly evening meeting of the Society was held on Tuesday, the 10th May, Mr. Justin Browne in the chair.

Mr. **Barnard** (Hon. Sec.) laid on the table the usual returns for the past month, viz.:—

1. Number of Visitors to Museum, on Sundays 356; on week days 685; total, 1,041.
2. Ditto to Gardens, 4,385.
3. Books and Periodicals received.
4. Presentations to Museum.
5. Time of leafing, flowering, and fruiting of a few Standard Plants in the Botanic Gardens during April:—
   - 12th. Common Elm, leaves commencing to fall.
   - 14th. Coe's late red Plum ripe.
   - 15th. Chinese Chrysanthemums commencing to flower.
   - 24th. Mountain Ash leaves commencing to fall.
   - 28th. Seeds of Hornbeam ripe.
   - 30th. Black Mulberry leaves falling.
6. Meteorological Returns.—From the Marine Board, tables for April, from Bruni Island, Swan Island, and Mount Nelson; Goose Island for February and March.

The presentations to the *Museum and Library* were as follows:—

1. *From Mr. A. Wilkins, Hobart.* An albino variety of the Brush *Kangaroo (Halmaturus Bennettii)*, from Spring Bay.

2. From Mr. Richard Chick. Sections of five telegraph cables from India, Egypt, the Balearic Isles, the Mediterranean, etc.
3. From Mr. R. M. Johnston. Specimens of lignified Pine, from the deep lead auriferous drifts, Back Creek, Tasmania.
4. From His Excellency Sir J. H. Lefroy. Specimen of Marble from Beaconsfield.
5. From Mr. R. B. Dyer. Specimens of Crustaceans and Echinodermata from Southport. Specimens of the foliage and fruit of the so-called "Pepper Tree" *(Drimys aromatica)*. Eggs of Mutton Bird *(Nectris brevicaudus)*, and Penguin *(Spheniscus minor)*.
6. From Mr. Rayner. Specimens of Iron Ore from the New Norfolk District.

*Library.*—From Mr. H. J. Buckland.—1. Buckland's "Geology and Mineralogy," 2 vols., 1837 (Bridgewater Treatise). 2. "Reliquiæ Diluvianæ," 1 vol., 1823, by the same author.

The SECRETARY read a paper by Baron von Mueller, K.C.M.G., M.D., F.R.S., entitled "Suggestions for an extended elucidation of the Plants of Tasmania."

The CHAIRMAN said that it would be seen that Baron von Mueller was desirous of getting information upon the botany of Flinders Island; he had already applied to the Society to assist him in this direction, and steps had been taken which would probably result in local assistance being procured in the way sought by the Baron, if not for Flinders, at least for Clarke's Island, and probably the botany of both islands is nearly the same.

Mr. R. M. JOHNSTON hoped that the local collectors in Tasmania would further the object of the learned phytologist. It was very desirable that the natural history of the Cryptogams of Australia should be brought up to the same state of perfection as the other divisions of the "Flora Australiensis." Mr. Bentham committed the completion of this onerous task to the illustrious Baron, and he (Mr. Johnston) was glad that there was now a probability of its being carried out.

Mr. STEPHENS read notes on a species of *Eucalyptus (E. hæmastoma)*, not hitherto recorded in the Flora of Tasmania, with its identification by Baron von Mueller. This tree is commonly known as the Gum-topped Stringy Bark.

Mr. JOHNSTON was glad that Mr. Stephens had devoted his attention so closely to the study of our Eucalypts, for it was only by a close special study of some particular family or group that we could now hope to improve or add to our existing knowledge. The proper classification of the Eucalypti is a very difficult matter, and the exact determination of closely allied species is rendered still more perplexing on account of the extreme variability due to local environments. Mr. Johnston gave an instance of this variability by reference to *E. amygdalina* as it grows in the Domain, in comparison with the same species as it grows on the hills around Launceston.

Mr. DOWDELL remarked that the timber of the Gum-topped Stringy Bark was known to be of a very superior quality—in fact, second only to that of the Blue Gum—and always commanded a ready sale in the market. The wood was easily distinguished from that of the Swamp Gum by the greater firmness of its grain.

Mr. GRANT expressed his surprise at learning that the Gum-topped Stringy Bark—the subject of the paper—had not been previously described by botanists, since it had long been well known in commerce, and was a valuable timber. He had been supplied with a large number of sleepers of this wood by Mr. Oates, whose mills were near Victoria, Huon River, and, therefore, the trees must abound there. The timber could readily be recognised by those accustomed to notice sawn woods. It had a different shade of colour to stringy bark, and to white or swamp gums, and also a different grain, which more nearly resembled that of blue gum. It was a close, heavy timber, remarkably clear and free from knots, which, independent of the colour, distinguished it from blue gum, that otherwise it most resembled. Mr. Grant had not observed the tree growing, or noticed its wood in any large quantity, in the Midland districts, and, therefore, as it was common about the high lands, he thought it probably preferred a more humid atmosphere than obtained in the interior of the country along the course of the railway. There was also another apparent variety which he had heard called "celery-topped" gum, but which was probably a slightly modified form of the gum-topped stringy bark, since it frequented the same habitats.

The SECRETARY read a paper by Charles E. Barnard, M.D., etc., etc. "On Auriferous Country and Gold-bearing Rocks."

Mr. STEPHENS said that the paper which had just been read indicated much thoughtful study on the part of the author, who evidently took a lively interest in his subject. He did not quite understand whether the author intended to mean that the views which he expressed as to the surface indications of the presence of gold were to be taken as universally applicable; but it would be improper to attempt to discuss in detail a paper covering such a wide range after only hearing it once read, and he would only venture to criticise one point which was too important to be passed without notice. The relations of intrusive rocks, especially those of granitoid character, to the primary strata had furnished matter for innumerable pamphlets and papers; but it might be sufficient to say that although the granite was often found as a disturbing element in Silurian districts, it was clearly proved to have formed no part of the agencies which had produced those remarkable flexures and contortions which are special characteristics of the primary rocks all over the world, and which were attributable to forces operating on a much wider scale. This question, however, would in itself furnish matter for a lengthy paper.

Mr. JOHNSTON complimented Dr. Barnard on the very interesting sketch he had given of the wonderful results produced by the discovery of gold in Australia, and upon the very faithful picture he had given of the principal features of gold-bearing rocks and drifts. Only in regard to some of the minor points, touched upon incidentally, could he desire to offer any additional comment in the way of qualification. With respect to the effect produced by intrusive rocks, Mr. Johnston inclined to the view taken by Mr. Stephens, viz., that only to a trifling extent could the disturbed condition of the auriferous rocks be attributed to the immediate influence of the intruded rocks. Mr. Johnston stated that Mr. Mallet's theory was best in accord with facts. Mr. Mallet attributes the crushing and crumpling of the surface rocks principally to the secular cooling of the earth, together with gravitation. The cooling of the earth, at a greater rate near the surface, must have caused at first violent contraction, and consequently violent rifts, crumplings, and local heat. To the latter may be attributed the chief immediate cause of the principal masses of molten eruptive rocks. With respect to the association of certain vegetable remains with our gold drifts in Australia and Tasmania, Mr. Johnston agreed with Dr. Barnard that the knowledge of such association might be useful to the miner as a guide in his search for free gold. Still it should be borne in mind that the vegetation only pointed to the age during which the principal formations were deposited. It might happen, as in the case of the Derwent leaf beds, described by him (Mr. Johnston) on a former occasion, that same vegetation might be associated with a matrix derived from non-auriferous rocks of Upper Palæozoic age. These were incidental matters, however, which did not affect the great value of Dr. Barnard's paper.

The usual vote of thanks having (on the motion of Mr. JOHNSTON, seconded by Dr. PERKINS) been accorded to the authors of the papers read, and to the donors of presentations, the meeting closed.

## JUNE, 1881.

The usual monthly meeting of the Society was held on Tuesday, the 14th June, Mr. T. Stephens, vice-president, in the chair.

The following gentlemen who had previously been nominated by the Council were balloted for, and declared duly elected as Fellows of the Society, viz., Messrs. Cecil J. Parsons, Frederick Mace, and Charles C. Nairn.

The SECRETARY brought under notice the following returns for the month of May, viz.:—

1. Number of Visitors to Museum—On Sundays, 476 ; on week days, 610 ; total, 1,086.
2. Ditto to Gardens, total 4,029.
3. Plants and Seeds received at Gardens :—From Mr. C. F. Creswell, Melbourne, Palm seeds from Lord Howe's Island, and 50 plants. From Mr. J. Sangwell, Melbourne, 48 Ferns. From Mr. Wm. Bull, London, 30 packets seeds. From Mr. J. T. Duthie, Superintendent Botanic Gardens, Saharanpur, N.W. Province, India, seven varieties of seeds of Coniferæ. From Mr. J. Latham, Liverpool-street, 30 packets imported seeds. From Baron Ferd. von Müeller, 3 packets seeds.
4. Plants, etc., sent from Gardens :—To Messrs. Shepherd and Co., Sydney, 1 box Bulbs, various. To Mr. C. F. Creswell, Melbourne, 1 ditto ditto. To the Horticultural Gardens, Melbourne, 1 ditto. To Melbourne Botanic Gardens, 1 case of plants and Sphagnum Moss. To Lieut. James, H.I.J.M. ship Riujio, 25 packets seeds. To Captain Fukushima, of the same ship, 50 ditto ditto.
5. Tench supplied :—To the Acclimatisation Society, Geelong, 132 fish.

*Meteorological Returns.*

1. From the Marine Board :—Tables from Mount Nelson and South Bruny for May.
2. From Mr. D. C. Purdy :—Tables from Macquarie Harbour for March and April.

Time of leafing, flowering, and fruiting of a few Standard Plants in the Botanic Gardens during May, 1881 :—

10th. Medlars commencing to ripen.
21st. *Photinia serrulata*, commencing to flower.
23rd. *Diosma alba*, ditto.
28th. Ailanthus, leaves all shed.
30th. *Spiræa prunifolia plæno*, commencing to flower.

The presentations to the Museum were as follow :—

1. From Mr. H. A. Ward, Rochester, New York:—Skin of fox prepared for mounting. Cast of Upper Silurian Fossil (*Homalonotus delphinocephalus*).
2. From the Exhibition Commissioners:—Specimens of Minerals, Models of Fruit, etc., etc.
3. From His Excellency Sir J. H. Lefroy, C.B., K.C.M.G., etc. :—A framed portrait of Captain Cook.

The CHAIRMAN exhibited some specimens of the rocks of Port Cygnet, together with rolled pebbles from the drift of the Huon Valley, which had been forwarded to the Museum ; and remarked that the latter were representatives of rocks not now found *in situ* within the settled districts of the south, and that with reference to the question of the auriferous capabilities of Port Cygnet there was not yet much that could be added to the information already communicated to the Society.

The HON. SECRETARY read a paper contributed by Professor R. Tate, Assoc. Linn. Soc., F.G.S., " On Type Species of Tasmanian Shells, unrecorded in the ' Census of Tasmanian Shells.' "

The CHAIRMAN read, "Notes on a species of *Zieria* (*Z. veronica*)" by Augustus Simson, F.L.S., with its identification by Baron von Müeller.

Mr. E. J. **Crouch**, M.R.C.S., Eng., read a paper on "The Queen's Domain, with suggestions for its improvement."

A long and animated discussion, in which most of the Fellows present took part, followed the reading of this paper, and many valuable and practical suggestions were brought out. It was ultimately determined, on the motion of Mr. **Barnard**, seconded by Mr. **James Grant**, that a committee of this Society, consisting of Mr. Belbin, M.H.A., Mr. F. Abbott, Superintendent of the Botanic Gardens, Dr. E. L. Crowther, M.H.A., Captain Stanley, R.N., Mr. John Swan, Mr. Justin Browne, and Mr. E. J. Crouch, with power to add to their number, be formed to consider the subject in all its bearings, and to confer with the Government as to the best means of contributing to the improvement of the Domain.

The meeting closed with the usual vote of thanks to the authors of the various papers, and the donors of presentations to the Museum.

## JULY, 1881.

The monthly evening meeting of the Society was held on Tuesday, the 12th of July; His Excellency, the President, in the chair.

Mr. W. F. Petterd, of Launceston, who had previously been nominated by the Council, was balloted for, and declared duly elected as a Fellow of the Society.

The hon. secretary, Mr. **Barnard**, brought forward the following returns for June :—

1. Number of visitors to Museum :—On Sundays, 374 ; on week days, 843 ; total, 1,217.
2. Do. to Gardens, 3,495.
3. Plants received at Botanic Gardens :—From Mr. J. Smith, Riddle's Creek, Victoria, 45 varieties of Fruit Trees. From the Horticultural Society's Gardens, Melbourne, one bundle new Fruit Scions. From Royal Gardens, Kew, England, one case of Willow Cuttings. From the Rev. — Codrington, Norfolk Island, one sack of Norfolk Island Pine Seeds.
4. Plants sent from Gardens :—To Rev. M. W. Gilleran, for church grounds, Ouse, 50 plants. To Right Rev. Bishop Murphy, 50 plants.
5. Books and Periodicals received.
6. Presentations to Museum.

*Meteorological Returns* :—

1. From the Marine Board, tables from Kent's Group Lighthouse for February, March, April, and May; Cape Wickham, do. ; Goose Island, do. for April and May ; Swan Island, do. for May ; Bruny Island, do. for June ; and Mount Nelson, do. do.
2. From Mr. D.C. Purdy, Macquarie Harbour, table for May.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during June, 1881 :—

17th. *Maclaura aurantiaca*, commencing to shed leaves.
20th. Common Privet, ditto.
25th. *Iris alata*, commencing to flower.
28th. *Calycanthus præcox*, in flower.
30th. Black Mulberry, leaves all shed.

The presentations to the Museum were as follow :—

1. From Captain *Rapp, barque Italy,* Stalactites and Crystals of Carbonate of Lime, from a cavern at Hamelin Bay, West Australia.
2. From Master *B. Watchorn,* specimens of Tin Ore, etc., from Mounts Bischoff and Heemskirk.

3. From Mr. E. D. Swan, a Black Magpie *(Strepera arguta)*, mounted.
4. From Mr. W. Murray, Glenorchy, a Brown Trout *(Salmo fario)*, caught in the O'Brien's Bridge Rivulet.
5. From Mr. A. J. Taylor, cast of face of Lord Brougham.
6. From the Tasmanian Commissioners, Melbourne Exhibition, 1880-1 :

*A. From the Belgian Court*, Melbourne Exhibition :--Samples of Cardboard ; two do. of Indigo ; one of Ultramarine ; four do. of manufactured Sulphur ; Iron Carriage, and Spiral Springs ; Specimens of Artificial Marble, samples of Tiles, Slate, etc.

*B. From the Victorian Court* :—Two Cores from Diamond Drill from Stawell and Creswick, Victoria.

Arsenical Pyrites, from 954 ft. level, Sandhurst (from Sandhurst School of Mines); Burnt Pyrites and Pyrites Tailings (from do.); Phacolyte, with Calcite (from do.) ; Lava Dyke Stone, associated with Garden Gully Reef (from do.)

Iron Ore from Traralgon Creek (from do.)

Do. from Dookie (from do.)

Cobalt Ore, from Walhalla and Alexandra (from do.)

Antimony, Sulphide and Oxide ; Antimony Regulus ; from Ringwood (from do.)

Calcite, from Dookie (from do.)

Lignite, from Lal Lal (from do.)

Mammillated Sandstone (metamorphosed) ; the bounding rock of the Garden Gully Reef (from do.)

Infusorial Earth, from Amherst (from do.)

Crystal Sand, from Brighton Beach, Victoria.

*C. From the South Australian Court* :—

Pyrolusite, from Tangie, S.A.

Bethangar Copper Ore, two specimens.

Atacamite and Red Oxide of Copper, from Moonta Mine.

Copper Pyrites, from do.

Ditto, from Wallaroo Mine.

Yellow Copper Ore, from do.

Copper Pyrites, from Kurella Mine.

Atacamite, Massive, from Moonta Mine.

Borinite, from do.

Peacock Copper Ore, from Moonta.

Ingot of Smelted Copper, from Wallaroo.

*D. From New South Wales Court*:—

Kerosene Shale, from Hartley, N. S. Wales.

Lignite, overlying do., N. S. W.

Shale, from Tyer's River, do.

Antimony Ore, do.

Sulphide of Antimony, do.

Asbestos, do.

Ingot of Smelted Tin, N.S.W.

Fibre, from Fiji.

Coffee, from do.

Seed of Sea Island Cotton, from do.

*E. From Tasmanian Court* :—

Polished Slab of Fossiliferous Limestone, from Bridgewater. Donor, Mr. E. Rayner.

Ditto, from Maria Island. Donor, Mr. R. Robinson.

Mineral Map of Tasmania.

Serpentine, Polished Cube of, locality not stated.

Two Photographic Views of Hobart, framed.

*Library.* From Mr. J. Barnard. Two copies of Baron von Mueller's work, *entitled* "*Select Extra-Tropical* Plants, suitable for Industrial Culture," *for Library, and for the* use of the Superintendent of the Botanic Gardens.

Mr. Stephens exhibited specimens of a paper-like material used in stereotyping at the office of the *Launceston Examiner*, and one from the establishment of the Hobart *Mercury*. This soft and flexible material has almost universally superseded the use of plaster moulds in stereotyping, and the sharpness of the type cast from it, when properly prepared, is quite remarkable.

Mr. Nowell presented some tables which he had compiled with the assistance of Mr. Langworthy, showing the mean of the observations for the five years, 1871-5, taken at the lighthouses and other coast stations in Tasmania, and published by the Society; and read some remarks upon the subject, with special reference to the winds in Bass' Straits and the climate of the West and North-West Coasts.

The Chairman remarked that he entirely agreed with the author as to the importance of multiplying registers of the rainfall, the simplest and easiest of all observations, and one which becomes very interesting for comparing different seasons. Probably the amount of rainfall has more to do with the agricultural or pastoral value of different districts than temperature or anything else; and he had on a previous occasion advocated the employment of the masters of common schools, many of whom would no doubt be very willing to take charge of a rain-gauge, and perhaps of other instruments.

Captain Stanley remarked that he thought there must be something wrong with the figures relating to the pressure of the wind. He believed that those adopted at the lighthouses were guessed by the observers, and not arrived at by the aid of anemometers. It was not the custom in the colonies to use Beaufort's scale. That in use was one common to all the Australasian colonies, and consisted in supposing that the wind ranged in force from 0 to 6, the figure 6 representing hurricane force. Beaufort's scale, or that in common use in the Royal Navy, supposed the force of the wind to be represented by figures, ranging from 0 to 12—0 representing a calm, and 12 a hurricane; the intermediate figures were judged by the description and number of sails the ship would carry or might be happening to carry at the time, and in relation always to a well-conditioned man-of-war. As regarded private observations, great care would have to be taken by observers, and it would be necessary to know what kind of instruments were used. Aneroids were less trustworthy instruments than marine barometers; their corrections varied according to their readings; as, for instance, an aneroid might be perfectly correct when registering a height of 30·50, and much in error at a height of 29·50. This description of barometer would most likely be the one chosen by private observers, as being portable and simple. On board a man-of-war it was only used in conjunction with a marine barometer. With regard to the force of the wind observed at Mount Nelson and Kent's Group being so much lower than at other localities, he thought it might be owing to the fact that easterly winds, which blew during several months of the year, appeared to blow much stronger at sea level. He had noticed when employed in the survey of Bass' Strait that often he had been able to observe with a theodolite comfortably on the summit of a high hill when it was blowing a strong easterly wind at sea level; in fact, the diminution of the force of the wind was quite noticeable during the ascent.

Mr. Justice Dobson thought it undesirable to publish any meteorological observations with the imprint of the Royal Society unless we were satisfied as to their accuracy. That Mr. Nowell's paper cast a doubt upon the accuracy of the instruments used. That these might be tested when the lighthouses were visited, by procuring a duly regulated barometer and thermometer of the Kew Standard, and by taking these instruments round and comparing with them those used at the lighthouses, the accuracy or errors of which would then be ascertained.

The Chairman remarked that he agreed very much with Mr. Justice

impossible to discriminate fr
At the same time, he thought the Society under an
Nowell for taking the trouble to examine and adjust th
hoped his remarks would not be taken as depreciating
labour ; he could only deal with the figures furnished

Mr. NOWELL was quite willing, as there appeared to
the accuracy of the observations themselves, or of the
which they were made, that the paper should not be publi
would have been to some extent attained by directing
subject, and by eliciting the information with which they h
by the members who were present. Since he had com
he had casually taken up a publication, emanating from
servatory, containing a large number of meteorological
tending over several pages ; and on looking at the prefat
found that the work was done by the astronomer, with the
whose assistance he had solicited ; and the speaker sugg
thing of the same kind might be done here. Meteorologi
had been taken at New Norfolk for a series of years
Shoobridge, but they had not been reduced. Work of th
he thought, easily be done by organised co-operation among
teers. He hoped that the discussion which had taken
the means of obtaining further information as to the clim
and North-west Coasts, a part of the colony which at th
was exciting so much interest.

[Since the meeting the following interesting observati
received from Mr. S. B. Emmett, of Circular Head :-
all of rain here is about 45in., in the most 69in., and lea
ange of thermometer, 57deg. at 9 a.m. Heaviest ga
uring May, June, and July, always ending with thun
ain begins and the wind shifts. Thunder never heard (?
lows from any quarter) from S.W. to E. Barometer ri
E. and falls from N.E. to W. Thunder not heard with
·60. For the gales from N.W. the barometer falls to 29 t
verage. Once, twenty-five years ago, the barometer fell
orms here

2. Mr. James Smith, of Westwood, Forth, "in recognition of his rare perseverance and remarkable success in the discovery of Tin at Mount Bischoff."

The Rev. J. Wilkes Simmons and Mr. C. J. Atkins, who had previously been nominated by the Council, were balloted for, and declared duly elected as Fellows of the Society.

The Hon. Secretary, Mr. Barnard, brought forward the usual returns for the past month, viz.:—

1. Number of Visitors to Museum:—On Sundays, 437; on week days, 775; total, 1,212.
2. Ditto to Gardens:—Total, 4,470.
3. Plants, etc., received at Gardens:—From Mr. J. B. Walker, plant of *Anthocercis Tasmanicus*. From Botanic Gardens, Melbourne, 53 plants. From Baron von Mueller, bulbs of a species of *Crinum*; seeds of *Macrozamea Mooreii*. From Mr. G. Brunning, Melbourne, 43 Roses. From Mr. J. Latham, 30 Roses. From Miss Solly, 5 packets seeds. From Messrs. Shepherd, Sydney, 45 plants and 24 new varieties of Gladiolus. From Mr. C. F. Creswell, Melbourne, 10 plants.
4. Seeds sent from Gardens:—To Mr. S. Purchase, Parramatta, 50 packets; to Messrs. Shepherd and Co., Sydney, 50 ditto.
5. Periodicals received.
6. Presentations to Library.
7. Ditto to Museum.

*Meteorological Returns*:—

1. From Marine Board, Tables from Goose and Swan Islands for June.
2. From the Government Astronomer, Melbourne, Record of Meteorological Observations for November and December, 1880.
3. From Dr. Hector, Meteorological Observations taken in New Zealand during the quarter ended March 31; Observations taken at Wellington from February to June, 1881.

Time of leafing, flowering, and fruiting of a few Standard Plants in the Botanic Gardens during July:—

9th. First Snowdrop, in flower.
12th. *Cytisus leucanthus*, commencing to flower.
15th. *Arbutus unedo*, ditto.
18th. *Garrya elliptica*, ditto.
25th. Yellow Crocus, ditto.
31st. White Mulberry, buds bursting.
31st. White Hyacinth, commencing to flower.
31st. Almond, ditto.

The presentations to the Museum and Library were as follow:—

*To Museum*:—

1. From the Hon. W. A. B. Gellibrand, M.L.C.—A Native Tiger (*Thylacinus cynocephalus*).
2. From Mr. Maurice Weston, per Mr. Curzon Allport.—A White Hawk (*Leucospiza Novæ-Hollandiæ.*)
3. From Mr. Conrad, per Mr. G. Thureau.—An immense Claw of a Crab, from the West Coast.
4. From Mr. W. Aikenhead, Launceston.—Specimen of Copper Pyrites, from the Rising Sun claim, Beaconsfield. Silver-Lead Ore, from Mount Claude.
5. From the Rev. H. E. Drew.—A Young Turtle, from the Great Barrier Reef.
6. From Professor Ward, Rochester, United States.—Twenty-six Casts of Fossils, named and mounted.

*To Library :—*

1. From the United States Government, per Captain G. M. Wheeler, Corps of Engineers.—Geographical Surveys of the Territories West of the 100th Meridian ; Vol. 2, Astronomy, etc., 4to; Vol. 3, Geology, do.; Vol. 4, Palæontology, do.; Vol. 5, Zoology, do.; Vol. 6, Botany, do.; Topographical Atlas.
2. From the Smithsonian Institution, Washington.—Miscellaneous Collections, Vols. 13, 14, 15, 16, and 17, unbound ; Contributions to Knowledge, Vol. 22 ; Smithsonian Reports, 1877 (3 copies) and 1878.
3. From United States Government, per F. V. Hayden, U.S. Geologist. —Geological and Geographical Survey of the Territories—Colorado and Adjacent Territories, 1876 ; do. Idaho and Wyoming, 1877 ; Bulletin of the Survey, Vol.4, Nos. 2, 3, 4, Vol. 5, No. 1 ; Entomological Commission, 1877, relating to Rocky Mountain Locust ; Bibliography of North American Invertebrate Palæontology ; Catalogue of Publications of the Survey, Report, Vol. 12, 4to, bound.
4. From the Government of Wisconsin, U. States, per T. C. Chamberlin, Chief Geologist.—Geology of Wisconsin, 1873-77, 1 Vol., 4to, bound, and maps.
5. From U. States Coast Survey Department.—Report of Superintendent, 1875.
6. From the Museum of Comp., Zoology, Cambridge, U.S.A., per Alex. Agassiz.—Bulletin, Vol 4, Air-breathing Molluscs, by W. G. Binney, 2 Vols.; Bulletin, Vol. 5, Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10 ; Vol. 6, Nos. 8, 9, 10, 11 ; Memoirs, Vol. 5, No. 2, " Report on Hydroida," by G. J. Allman, M.D., etc.; do., Vol. 6, No. 1, (pts. 1 and 2), "Auriferous Gravels of the Sierra Nevada," by J. D. Whitney ; do., Vol. 7, No. 2, pt. 1, "The Climatic Changes of later Geological times," by J. D. Whitney ; do., " Report on " Fossil Plants of the Auriferous Gravel Deposits of the Sierra Nevada," by L. Lesquereux ; do., " Report on the Florida Reefs," by Louis Agassiz ; Report of Curator of Museum of Comparative Zoology, Harvard College, for 1879-80.
7. From the American Philosophical Society, Philadelphia.—Proceedings, Nos. 101 to 106, January, 1878, to June, 1880. List of Members.
8. From the American Academy of Arts and Sciences.—Proceedings 1877 to 1880 (5 parts).
9. From the United States Naval Observatory, Washington.—Washington Observations for 1869, 1870, 1871 ; Appendix for 1870, 1872, 1874, 1876 ; Tables of Transit Observations, 1872 ; Catalogue of Stars, Appendix 1 ; Researches on Motion of the Moon.
10. From the Essex Institute, Salem, U.S.A.—Bulletin, Vols. 10 and 11 (unbound) ; Historical Collections, Vols. 14, 15, 16.
11. From the Boston Society of Natural History.—Proceedings, Vol. 19, parts 3 and 4 ; Vol. 20, parts 1, 2, 3. Memoirs, Vol. 3, part 1, Nos. 1, 2, 3 ; Occasional Papers, No. 3, 1880.
12. From the American Association for the Advancement of Science. —Proceedings, Vols. 26 and 27 ; 1877, 1878.
13. From Connecticut Academy of Arts and Sciences.—Transactions, Vol. 3, part 2, Vol. 4, part 1.
14. From the " Lick" Observatory Trust, San Francisco.—Report of Observations made on Mount Hamilton, 1880.
15. From the Canadian Institute, Toronto.—Proceedings, 1879, Vol. 1, part 1.
16. *From the Chief Signal* Officer, Washington, U.S.A.—Daily Bul*letins of Weather Reports*, November and December, 1874 ; *January, 1875,* January, February, and March, April and May, 1877.

17. From Her Majesty's Secretary of State for India.—Account of the Great Trigonometrical Survey of India, 1879, Vols. 2, 3, 4 and 5; four vols. 4to.
18. From the Superintendent Geological Survey of India.—Memoirs of the Survey, Vol. 15, part 2; Vol. 17, parts 1 and 2. Palœontologia Indica, Ser. 14, Vol. 1, part 1; Ser. 13, parts 1 and 2; Ser. 10, Vol. 1, parts 4 and 5. Records of the Survey, Vol. 12, part 4, 1879; Vol. 13, parts 1 and 2, 1880.
19. From the Royal Astronomical Society.—Memoirs of the Society, Vol 41,. 1879, and Vol. 45, 1880.
20. From the Trustees of the British Museum.—Catalogue of Lepidoptera, parts 3 and 4; Illustrations of Typical Specimens of Coleoptera; part 1, 1879.
21. From the Literary and Philosophical Society of Manchester.—Proceedings, Vol. 16, 1876-7; Vol. 17, 1877-8; Vol. 18, 1878-9; Vol. 19, 1879-80; Memoirs of Society, Vol. 8, 1879.
22. From the Royal Asiatic Society.—Journal, Vols. 11, part 3; 12, parts 1, 2, 3; 13, part 1.
23. From Royal Geographical Society.—Proceedings for February to December, 1880, January to March, 1881 (14 pts.) Journal of Society, Vol. 49, 1879.
24. From the Geological Society.—Quarterly Journal, Vol. 26, Nos. 141 to 144; Vol. 27, No. 145. List 1880.
25. From Zoological Society, London.—Proceedings 1879, part 4; 1880, parts 1, 2, 3; Catalogue of Library; List of Vertebrated Animals.
26. From the Linnean Society.—Journal, Vol. 17, Nos. 103 to 105; Vol. 18, Nos. 106 to 110 (Botany); Journal, Vol. 15, Nos. 81 to 84 (Zoology).
27. From Statistical Society.—Journal, Vol. 43, part 4—12/80.
28. From the Institution of Engineers in Scotland.—Transactions, Vol. 23, 1879-80.
29. Royal Colonial Institute.—Proceedings, 1879-80, Vol. 11.
30. From the Malacological Society of Belgium.—Annals of the Society, Vols. 9 and 11, 1874 and 1876.
31. From Dr. Agnew.—Journal of the Historical and Archæological Association of Ireland, Vol. 5, Nos. 39 to 41.

The Secretary, in reporting the above presentations to the Library, drew the special attention of members to the number and value of the books and publications which had been received from various scientific institutions of America, in exchange for the Transactions of the Society.

The Chairman read a short paper on the question of establishing in the Society's Gardens a "Class Ground," or systematic arrangement to illustrate the classification of plants according to their Natural Orders; with a communication from Dr. Agnew on the subject, and a letter from Dr. Schomburgk, of the Botanic Gardens, Adelaide.

A lengthened discussion followed the reading of this paper, in which most of the Fellows present took part, eliciting many different views of the proposal; and it was ultimately determined to resume the consideration of the subject at the next evening meeting of the Society.

A vote of thanks to the donors of presentations to the Museum and Library closed *the proceedings, special* reference being made to the very *liberal and valuable donations of books* received from the United States *Government and various scientific* institutions in America.

## SEPTEMBER, 1881.

The monthly evening meeting of the Society was held on Monday, the 12th September; His Excellency Sir John Henry Lefroy, K.C.M.G. (the President), in the chair.

Messrs. William Crosby, jun., of Hobart, and S. H. Wintle, F.L.S., of George's Bay, who had previously been nominated by the Council, were balloted for, and declared duly elected as Fellows of the Society.

The Hon. Secretary, Mr. Barnard, called attention to the following returns, received since last meeting, viz.:—

1. Number of visitors to Museum during August:—On Sundays, 462; on week days, 700; total, 1,162.
2. Ditto to Gardens, August:—3,985.
3. Plants received at Gardens:—From Messrs. Shepherd and Co., Sydney, 70 plants. From Mr. C. F. Creswell, Melbourne, 10 plants. From Messrs. J. N. Verschaffelt, Ghent, Belgium, 45 Rhododendrons. From Captain Fisher, of the "Loongana," 12 Ferns.
4. Plants, etc., sent from Gardens:—To Mr. C. F. Creswell, Melbourne, one case of plants and seeds. To the Horticultural Society, Melbourne, 12 Peony plants. To Mr. G. Brunning, Melbourne, one case containing plants and seeds. To Mr. John Smith, Riddell's Creek, Victoria, one box of plants and seeds. To Mr. J. Sangwell, Melbourne, one case of plants and seeds. To Botanic Gardens, Melbourne, Pine seeds. To Messrs. Shepherd and Co., Sydney, 12 papers of seeds. To Messrs. Purchase, Parramatta, 12 papers seeds. To Messrs. Vilmorin and Co., Paris, seeds of various Eucalypti. To Messrs. Huber and Co., Hyeres, France, seeds of Eucalypti. To Baron Ferd. von Mueller, Melbourne, a collection of seeds.
5. Books and Periodicals received.
6. Presentations to Museum.

*Meteorological Returns:—*

From the Marine Board, Tables from Bruny Island, for August; Mount Nelson, for August; and Goose Island, for July and August.

Time of leafing and flowering of a few Standard Plants in the Botanic Gardens, during August:—

20th. Gooseberries commencing to break.
22nd. Horsechestnut ditto.
25th. Elder ditto.
26th. Apricots ditto.
27th. Lombardy Poplar ditto.
30th. Common Elm ditto.

The presentations to the Museum were as follow:—

1. From Mr. C. H. Glover, Franklin. Specimens of Swainson's Antechinus *(Antechinus Swainsonii)*, and the White-footed Antechinus *(Antechinus leucopus)*.
2. From Mr. D. Lewald. Specimen of Molybdenum, crystallised on firebrick at the Tin Smelting Works, Hobart.
3. From Mr. Justin Browne. Specimen of Silver-Lead ore from Mount Claude.
4. From Mr. Carson, Sandy Bay. A Starling *(Sturnus vulgaris)*.
5. From Mr. E. Lipscomb. A Satin Bower Bird *(Ptilonorhynchus holosericeus.)*
6. From Mr. J. McDonald. Specimen of Iron ore, from Campania.
7. From Mr. T. Stephens. Specimens from the Pink Terrace, Lake Rotomahana, New Zealand.
8. From His Excellency the Governor. A curiously perforated Rock Specimen from Table Cape.

In reference to this presentation, His EXCELLENCY remarked, "I place before the Society two specimens of a compact fine grained sandstone from the beach at Table Cape, which have interested me by their curious condition of perforation, which I have attributed to the action of dropping water.

"These pieces are broken off the dividing walls of an assemblage of shallow, more or less circular basins, which occurs below high water-mark, and covers some hundreds of square feet. The perforations in their original position are vertical. The basins are quite smooth within unless where there is a mound of the same character in the centre, and they remind me of what we always find on the floor of caves where there is much dropping of water charged with carbonate of lime. Pools form on the floor. The water is sent off in circles from the centres of drip. The lime is deposited where it meets a check, and there ridges are built up. In the case of a floor of fine sand, the sand itself would be driven off from centre of drip and deposited in the same way—to be itself, as it consolidated, acted upon by other drip.

"If my conjecture is correct, the land at Table Cape once extended considerably to the eastward, and contained at this spot a large cave, the floor of which remains. I am aware that opinions I much respect attribute the perforations to the action of boring animals; all I can say is, that looking at the isolation of the effect, and its general character, that explanation does not satisfy me.

"The absence of a stalagmitic character about the specimens would be accounted for by the absence of lime in the formation."

His Excellency the President read a paper "On the Magnetic Variation at Hobart, and its change in amount since last determined."

Mr. C. H. GRANT observed that this Society, and the public generally, were under a deep obligation to His Excellency for bringing under their notice the very practical matter now occupying their attention. Owing to the system of survey of properties now adopted in this colony, it is certain that the variation in the magnetic deviation must lead to errors and confusion, resulting in much annoyance and litigation. In settled districts where the boundaries were kept well defined on the ground, their correct compass bearings at any time was a matter of comparatively small importance; but in some cases such lines had been originally marked in a very temporary manner, and a surveyor now running them afresh must take different directions, and therefore quite alter the character of the property. As a matter of fact, great difficulty is now constantly felt in reconciling new surveys of separate properties with those made formerly, or with the district maps; and, in despair, the attempt to do so is often abandoned, causing serious loss both of time and money. Now that property had become more valuable and divided, it was time, he thought, that a special survey department should be organised under a Surveyor-General, who would insist upon all surveying operations being conducted on a strictly scientific basis, both in the field and office, and that all the work done should be thoroughly checked and corrected with known points. One of the first matters to engage attention should be the careful determination and official record of the magnetic deviations from year to year in different localities.

Captain STANLEY remarked, that in order to determine with accuracy the variation of the compass, a good azimuth compass was a matter of great importance; it was also very necessary to take magnetic bearings on numerous points of the compass; he had made observations while conducting the Marine Survey of Victoria with what was considered a splendid instrument, and yet on certain portions of the arc the bearings were as much as 55min. in error. The only way to obtain the variation with accuracy was by a multiplicity of observations, or by what was known as a "Mean of Errors." In this way it was that Captain Flinders succeeded in fixing his Astronomical positions; he would observe perhaps one hundred lunars, and though various of his results were much in error, the mean was surprisingly exact. In taking observations for the variation of the compass, it was a matter of importance that a situation should be chosen from which all-round observations could be obtained: he had observed the variation at Swan

Island and found it to be (speaking from memory) 10deg. 30min. E. In Melbourne the variation was 8deg. 43min. E., and increasing 1½min. annually. It was most important that the variation of the compass should be accurately determined in different parts of Tasmania, because there certainly was a difference, and the land surveyors always used the Magnetic North, which was likely to lead to inextricable confusion hereafter. He believed that the trigonometric survey of Tasmania had never been completed, and felt certain that a great deal of the work would require to be gone over again, because he knew from experience that the points had not been preserved. In Victoria, stone towers, or strong wooden structures, preserved a centre over which a staff was erected. He was quite sure that all the members present felt grateful to His Excellency for the trouble he had taken in preparing a paper for the meeting, and for calling attention to a manifest deficiency.

Mr. J. M. CLARKE, while thanking His Excellency for calling attention to so important a subject, could add but little to what had been said by such practical men as Mr. Grant and Captain Stanley. His experience in the field was very limited, but speaking from more than 20 years' experience in office work, collating surveys made from the early days of the colony to the present time, he could say that the discrepancies which are perpetually arising must tend to litigation, and are gradually causing great and increasing confusion in the charts of the colony.

Mr. STEPHENS said that though he could not lay claim to much practical or theoretical acquaintance with the business of surveying, or the question of magnetic variation, it had been impossible for him to avoid seeing something of the difficulties which are a necessary consequence of a system of survey conducted on magnetic lines; and he had been informed upon good authority that serious complications were continually occurring through the want of accord between the representation of surveyed lines on the county maps, and their actual position. If the trigonometrical stations established by the late Mr. Sprent had been carefully maintained, like those of the geodetic survey of Victoria, the difficulty of reconstructing the system of surveys would have been greatly lessened; but many of them have been utterly destroyed, and probably in no single instance would it be possible to determine accurately the central point of the original station. The prominence given to the subject in the paper read by His Excellency, than whom we could not have a more competent authority, would probably lead to some satisfactory result.

Further discussion followed, in which Mr. Justice DOBSON took part, with the CHAIRMAN and the previous speakers.

Mr. Stephens read "Notes on the proposal for establishing a 'Class Ground' for typical plants, in the Society's Gardens."

Mr. F. ABBOTT stated that the question of the formation of a class ground of typical plants had been before the Council of the Society on previous occasions, the late Rev. W. W. Spicer having been deputed to confer with him on the subject. He (Mr. Abbott) pointed out the difficulties in the way here, and, after going fully into the matter, it was considered that the time had not arrived for commencing such an arrangement. When writing on this matter some years ago he had expressed his opinion that however valuable natural arrangement might be for educational purposes, it was of but little interest to the general public, and except in places where it was utilised for the advancement of botanical science, it had better not be undertaken. In this opinion he was strengthened by a recent visit to the class ground of the Melbourne University, which is claimed as being one of the best kept in the colonies, and must confess to a feeling of disappointment at the appearance of the grounds, which were certainly the reverse of attractive. Not only were plants the most incongruous brought into juxtaposition, but many of them were languishing and others had died out. From Dr. Schomburgk he also learned that the amount of popular appreciation bestowed on the Class Ground in the Adelaide Gardens is very limited indeed. In making the foregoing remarks Mr. Abbott did not wish it to be understood that he was averse to the formation of a class ground when the proper time arrived for so doing. He inclined to the opinion that such an arrangement should always be in connection with a good herbarium, botanical library, and lecture room, as it is only under these conditions that the real utility of a Class Ground becomes apparent. The maintenance of an efficient Class Ground, covering about three acres, would cost at least from £100 to £150 per annum, a much greater expenditure than could possibly be met by the present resources of the gardens. The formation of a collection of Tasmanian plants he considered of primary importance.

Mr. Justice Dobson spoke in favour of forming a class ground, but on a limited scale, by merely selecting characteristic and typical plants well adapted to this climate; and with regard to the suggestion that a collection of plants indigenous to Tasmania should be formed in the Gardens, he pointed out that it would be impossible to do so owing to the dissimilar conditions of soil and climate, especially in regard to alpine plants.

Mr. Abbott explained that he did not object to the formation of class grounds when they could be made of practical utility, but he wished to point out that, as a rule, they were little appreciated by the general public, and that he did not consider the present the proper time to initiate the matter. With regard to size, he could only say he had asked Dr. Schomburgk's opinion as to what he considered essential, and that gentleman had replied that the Adelaide class ground covered two acres, but that the plants had not room to develop, and that he considered three acres little enough for the purpose. The proposal could not be carried out without additional expenditure, for it would be necessary to place the ground in charge of a man having at least some knowledge of the plants contained in it; the staff now employed at the gardens would be too limited to allow the work to be undertaken. In speaking of a collection of Tasmanian plants he referred only to those amenable to cultivation.

Mr. C. H. Grant believed that the time had hardly arrived for the consideration of the planning out of a class ground after the manner adopted in the Adelaide gardens, the chief difficulty being the already too numerous demands upon Mr. Abbott's time and the want of skilled assistance. However little attention such a ground might require, it would be in addition to what was already far more than fully engaged, and it would be better to devote any available time to subjects of a more popular nature. From his experience of these gardens, at Kew and other places in the Old World, they were of most limited general interest, and this in communities deeply permeated with a taste for scientific subjects, and numbering amongst their members many persons eminent for researches in botany and similar studies. He was not, therefore, surprised to hear Mr. Abbott state that in Melbourne these class gardens were entirely neglected, since neither the educated nor the popular bent of these colonies can be said to be in the direction of science. He felt sure that for one person who would cast a second glance at beds of plants arranged according to their natural orders, at least twenty would examine collections of general native plants, such as ferns or grasses, etc., on a rockery or other convenience made for growing them; and that such collections, if made as complete as possible, would be both interesting and instructive to visitors. He would, therefore, greatly prefer Mr. Abbott's suggestion, rather to procure and grow specimens of the Tasmanian Flora than to spend the same time and resources on a strictly botanic garden. Students of Botany generally commenced their studies in the class room, from Herbaria or readily obtained specimens, and, when imbued with an interest in the science, take up special groups of plants for more attentive consideration, rather than extend such throughout the whole of the orders. The object should be, he thought, (at least in this community) to popularise the love of flowers, and the knowledge of their characters and habits. It was, therefore, to be regretted that the Gardens did not possess an ordinarily good greenhouse, much less a large stovehouse, both of which were really necessary to exemplify the growth and beauty of plants either having their habitat in warmer climates, or produced under such artificial encouragement. It was not creditable to the Gardens, or to the colony, that such an urgent want remained unsatisfied. What he had seen of botanic, or class gardens, showed them to be most uninteresting. The plants could not be grouped for pleasing effect, and many, if not most, were difficult to grow in proper vigour side by side, when in nature they affected very different localities. Therefore the effect of the work was disheartening, and to those engaged in it would seem a waste of time as compared with what could be done with the same attention in a more popular direction. On the whole, therefore, he concluded that the time was inopportune for forming the class garden under consideration, but the subject might be advantageously reconsidered when there were greater facilities for giving it effect.

Dr. **Perkins** said, speaking from experience in the Edinburgh Botanical Gardens, the division of plants into their classes did not render the gardens unsightly or unattractive, for they were visited by hundreds of people who had no desire for the acquirement of scientific information. In the interests of those who wished to know something of the nature and habits of plants, it was desirable that a portion of the Royal Society's Gardens should be reserved for botanical studies. It had often been difficult to ascertain the correct name and species of shrubs and trees in the gardens, but owing to the recent efforts made by Mr. Abbott the writing could in many instances be deciphered, and a visit to the gardens rendered additionally interesting.

Captain **Stanley** remarked that he agreed with Mr. Grant as to the probability of the public not taking much interest in class gardens after they had been formed, but agreed with Dr. Perkins in the advisability of endeavouring to educate the people. He had only visited the class gardens at Kew once, and then had been unfortunate enough to find himself the only person there, but for all that he considered that such gardens were great educators. However, the subject seemed to him to hinge entirely on the question of money, and he did not think Mr. Abbott could be expected to do more than he did with the funds at his disposal.

Further discussion ensued, eliciting a diversity of opinion on the adoption of the proposal, in which His **Excellency**, Mr. **Swan**, and others, took part.

In reply, Mr. **Stephens** said that the chief objections which had been stated appeared to be that the proposal would involve increased expense, and that the cultivation of the plants would entail much additional care and trouble; but these difficulties he thought were imaginary ones. So far as he was aware, it had never been contemplated to occupy more than two or three roods of ground, where it could best be spared, and that it was chiefly a question of transplanting a limited number of plants, which are already doing well in the gardens with ordinary care, and arranging them according to their natural affinities. If a few square yards of such a class ground could be completed year by year it probably would be as much as was expected. It was not advisable to attempt to hurry anything of this kind, and as the matter was now placed on record, it would no doubt receive consideration.

The proceedings closed with the usual vote of thanks to the authors *of the papers read,* and to the donors of presentations.

## OCTOBER, 1881.

The usual monthly evening meeting of the Society was held at the Museum on Monday, the 10th of October; His Honor Mr. Justice Dobson, V.P., in the chair.

Mr. John Hamilton, who had previously been nominated by the Council, was balloted for, and declared duly elected as a Fellow of the Society.

The following returns for the past month were brought under notice, viz.:—

1. Visitors to Museum, on Sundays 581, on week days 786, total 1,367.
2. Ditto to Gardens 4,500.
3. Plants, etc., received at Gardens:—From Mr. C. F. Creswell, Sydney, 1 bag of Norfolk Island Pine seeds. From Mr. S. Purchass, Sydney, a case of Norfolk Island Pine plants. From Messrs. H. Low and Co., London, 58 plants, of which about one-half were dead on arrival. From Mr. C. F. Creswell, Melbourne, seven new Dahlia roots.
4. Seeds sent from Gardens to Messrs. Villmorin and Co., Paris, and the Botanic Gardens, Melbourne.
5. Books and Periodicals received.
6. Presentations to Museum—

Meteorology: 1. From the Marine Board, tables from Mount Nelson and Bruny Island, for September. 2. From the Government Observer, New Zealand, printed tables from Wellington, for July and August.

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during September:—

20th Moutan Peony commencing to flower.
24th Oak commencing to break into leaf.
26th Grape vines ditto.
27th Ash ditto.
28th Sycamore ditto.
29th Horsechestnut commencing to flower.
30th Robinia Pseudo-Acacia commencing to break.

The presentations to the Museum were as follows:—

1. From the Hon. W. A. B. Gellibrand, M.L.C. A Native Tiger (*Thylacinus cynocephalus*).
2. From H. Lamb, Esq., M.H.A. Two Native Devils (*Sarcophilus ursinus*), male and female, from Clarence Plains.
3. From Mrs. Gifford. Specimen of the red-rumped Parrakeet (*Psephotus hæmatonotus*), from Queensland.
4. From Mrs. Lodder. A number of additional specimens of Tasmanian Lepidoptera.
5. From Mr. Glover. A Bush Rat (*Mus sp.*), from Huon District.
6. From Master Pulleine. Five shells from Fiji.
7. From Mr. S. H. Wintle, Specimens from the Scamander Goldfield.
8. From Mr. Ives, Barque Ethel. A Flying Fish (*Exocetus volitans*).
9. From Mr. W. Doodie. Specimen of Agate from Camden Plains, near Mount Barrow.

The attention of the meeting was called to a donation of books, from the library of the late Dr. E. S. Hall, received from the representatives of that gentleman, and comprising about 130 bound volumes, together with a large number of official blue books, reports, pamphlets, etc.

A paper by Mr. S. H. Wintle on "The Scamander Goldfield" was read in the absence of the author, by Mr. STEPHENS; who remarked that the locality in question, lying as it did on the lower line between the boundary palæozoic and granitoid rocks, possessed special interest for the geologist, and that he could corroborate Mr. Wintle's statement as to the satisfactory prospects obtained from the quartz veins, so far as they have been tested.

The Chairman announced the discovery, on the West Coast, of a fern, new to the flora of Tasmania, in reference to which he read the following extract from a letter, received by him from Baron von Mueller :—"The fern of which you sent a small fragment is *Aspidium hispidum* of Swartz. As you rightly surmised it is new for Tasmania, though it does not show itself now unexpectedly, inasmuch as this fern has been found in two places of the colony of Victoria. For nearly half a century this Aspidium had not been noticed outside of New Zealand, but it has in later years also been gathered in Mauritius." This fern was recently procured by Mr. George Lefroy, some miles to the north of Macquarie Harbour.

The proceedings terminated with a vote of thanks to the author of the paper read, and to the donors of presentations to the Museum and Library.

## NOVEMBER, 1881.

The monthly evening meeting of the Society was held on Tuesday, the 15th November, His Excellency Sir John Henry Lefroy, K.C.M.G., the President, in the chair.

Messrs. H. M. Hull, E. B. Gawne, and W. H. Macfarlane, M.B., who had previously been nominated by the Council, were balloted for, and declared duly elected as Fellows of the Society.

The hon. Secretary, Mr. Barnard, brought forward the usual monthly returns, viz.:—

1. No. of Visitors to Museum, October, on Sundays, 559 ; on week days, 414 ; total, 973.
2. Ditto to Gardens ; total, 4,607.
3. Plants, etc., received at Gardens during September and October :—From Mr. C. F. Creswell, Sydney, 1 bag of Norfolk Island Pine Seeds, and 9 new Dahlia roots. From Messrs. H. Low, London, 50 plants. From Baron von Mueller, 6 papers of seeds.
4. Seeds sent from Gardens :—To the Botanic Gardens, Melbourne, 1 package ; to Messrs. Villmorin, Andrieux, and Co., Paris, 4 ditto ; to Mr. E. B. Heyne, Adelaide, 6 packets.
5. Books and periodicals received.
6. Presentations to Museum.

Meteorology.—Mount Nelson, from the Marine Board, table for October.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during October :—

8th. Carpinus betulus commencing to break.
18th. Ailanthus glandulosus, ditto.
20th. Black Mulberry, ditto.
21st. Common Lime, ditto.
22nd. Elm, commencing to shed seed.
25th. Melia azederach, commencing to break.
30th. Horsechestnut, in full flower.

The presentations to the Museum were as follows :—

1. From Mr. J. W. Johnston. Specimen of Native Bread (*Mylitta Australis*), from Broad Marsh.
2. From Mr. A. Jackson. A Musk Duck (*Biziura lobata*), from Hamilton.
3. From Mr. S. H. Wintle, F.L.S. A Pouched Lamprey (*Geotria Allporti*), from George's Bay. A large Crab (*Pseudocarcinus gigas*, Lamarck), caught in 70 fathoms water, off St. Patrick's Head, East Coast, Tasmania.
4. From Mr. E. B. Gawne. A Diamond Snake (*Hoplocephalus superbus*).

5. From the Rev. George Brown, C.M.Z.S. A Native Drum and 13 Spears, from New Britain. Specimens of the Shell from which the "Shell money" of New Britain is made.
6. From Mr. T. H. Bromfield. A young Porcupine Ant-eater *(Echidna setosa).*
7. From Mr. R. M. Johnston, F.L.S. Specimen of a species of Sea Bream (*Girella tricuspidata*), from Southport. In reference to this specimen, Mr. JOHNSTON remarks:—"This interesting fish was obtained by me from a dealer, and is locally known to the boatmen as 'The Sweep.' Hitherto this species was either not known to exist in Tasmania, or it may have been confounded with some other member of the 'Sea Bream' family. Like nearly all of this group, it is an excellent fish for the table, and, in my opinion, when in good condition, is superior to the 'Sand Mullet'(*Mugil cephalotus*), and almost rivals the 'Trumpeter' (*Latris hecateia*) in flavour. I have temporarily, with hesitation, placed it under Quoy Gaimard's *G. tricuspidata.* It is in some respects intermediate between the latter species and *G. simplex*, Richardson; but while it more nearly agrees with the latter in lateral and transverse series of scales, and in relative length of head, yet its peculiar, well marked, tricuspidate teeth ally it more closely with the former. The two species named are, however, very closely allied."

*Presentations to Library:—*

From the Ballarat School of Mines, two copies of the Annual Report for 1880.

From His Excellency the President, diagrams prepared by him to illustrate a lecture on the Southern Skies, delivered on the 17th ult., to be made use of hereafter for any instructional purpose the Council may think fit. Symons, British Rainfall, 1879. A file of the *Waratah Weekly News*, in manuscript. Portrait of Mr. W. Spottiswoode, LL.D., President of the Royal Society. Magnetical and Meteorological Observations taken in North America, by Captain Lefroy, R.A., and Sir John Richardson, C.B., M.D., 1855. Agricultural Report of Bermuda.

The President exhibited a number of harmonic curves drawn by Donkin's Harmonograph. This instrument is described in the Proceedings of the Royal Society for 1874. The mechanical construction of it is such that a finely pointed glass pen, following the motions of a pendulum, or of a regularly oscillating crank, traces an endless line on a sheet of paper which is itself in motion under the influence of another crank or pendulum. Some of the curves were produced with pendulums, and some by wheel-work.

In this instrument one or both of the pendulums may be made to revolve either in a circle or in an ellipse. The result is to produce an endless variety of beautiful figures.

The attention of the Fellows was particularly called to the remarkable fact that whenever the ratio of the times of vibration, or of vibration and rotation, is one which corresponds to a definite interval in music, say thirds, fifths, octaves, the result is a figure symmetrical and pleasing to the eye, as the result of the two notes is harmony to the ear, and whenever the ratio of the times is not a musical interval, the result is an unpleasing figure, as it would be a discord in music. This was illustrated by many examples.

Mr. R. M. JOHNSTON observed that the Harmonograph bore a slight resemblance to instruments, made by some machinery manufacturers, which produced similar curves. There was also a form of harmonics produced upon films of soap. In this instrument (the "Phoneidoscope") when true fifths, or *any other harmonic intervals* are put together, bubble rings *are developed; and if two persons sang* together into the instrument at an interval of a full tone, a most disturbed, stormy sea would present itself in the soap film.

The PRESIDENT remarked that the results Mr. Johnston mentioned all turned upon the same law of harmonics, although produced by somewhat different mechanical means.

A botanical paper, by Baron F. von Mueller, K.M.G., M.D., F.R.S., entitled "Notes on *Leontopodium catipes*," was read by the Secretary.

The meeting terminated with a vote of thanks to the authors of the papers, and to the donors of presentations.

# PAPERS.

## OPENING ADDRESS OF HIS EXCELLENCY SIR J. H. LEFROY, C.B., K.C.M.G., F.R.S., PRESIDENT.

[*Read* 12*th April*, 1881.]

Gentlemen,—The profound sense which I have of my slender qualification for the honourable position which the constitution of this society assigns to Her Majesty's representative, and of my inability to address you with the authority of a master in any field of the vast domain of science, shall not tempt me to take up your time with vain excuses for allowing myself to be placed in such a position. There has been, as you are aware, a considerable interval of time since my predecessor delivered an inaugural address upon a similar occasion. I should be unwilling to see the custom of an occasional presidential address abandoned, and I ask your indulgence for the remarks which, at the request of your Council, I have committed to writing, upon subjects of immediate interest to this Society, however wanting in scientific value.

*Museum and Gardens.*—I am afraid that I cannot congratulate the Society upon the prosperous state of its finances. We may be regarded in a double capacity: First, as a body of men cultivating natural science for the sake of the pure and inexhaustible pleasure derived from the study of nature, and of its value to mankind, in that capacity we ought to be and we are self-supporting; secondly, as trustees for the public in the maintenance and management of two institutions which may be fairly said to be necessary, and indeed indispensable in these days, but in which we have only incidentally a greater interest than the rest of the community, viz., the Museum and Public Gardens. These the public ought to support, and it admits the obligation. Does it do so adequately? I fear I must reply in the negative. Our Botanic Gardens are not even mentioned in a recent review, by Professor Thisleton Dyer, of the botanical enterprise of the Empire. Want of skilled labour, arising from want of funds, throws them out of all possible competition with other establishments. They are defective in native plants, although about one-fourth of our species are peculiar to Tasmania, and still more so in plants eligible for industrial culture or naturalisation in this island; and I cannot but refer to the condition of the plant labels, which are so necessary for popular instruction, as a standing reproach. Very many interesting flowering trees and plants are without labels; those that there are, are mostly old, defaced, and illegible. A larger and better conservatory is much required; and an economic museum, such as is now connected with most other establishments of the kind, could not fail to be of public utility in this colony also. These improvements cannot perhaps be expected until the public mind is more alive than it now seems to be to the importance of more widely diffusing natural knowledge, a direction in which the influence of this Society ought to weigh. I observe that our Museum had over 10,000 visitors in six months, of whom rather more than half were Sunday visitors. Better labels and fuller descriptive particulars are here also much required; and I may remark that I find we are much in arrears with binding, without which it is difficult to consult our scientific serials.

*Members and Papers.*—Our numbers, I am glad to observe, keep up, and have slightly increased, There are, I am confident, many gentlemen not yet enrolled whose adhesion would strengthen the Society, which needs to, as I conceive, rest upon a comprehensive basis, and to embrace a wide range of literary as well as scientific interests, if it is to outlive the first harvest of Tasmanian discovery. When I turn to what, after all, is the test of the vitality of any scientific society, the number of original contributions from its members, I find that we have received 60 since my predecessor addressed you. It would be improper, and it is needless, for me to allude, except for a passing expression of gratitude, to those two Fellows to whose indefatigable industry we are indebted for a very large number of them. They may be classified as follows. I think the list is interesting as indicating the present direction of scientific activity here:—Botanical subjects, 13; subjects of geology, 10; land and sea shells, 16; our domestic pest, the codlin moth *(Carpocapsa pomonella)*, 4; other subjects of Natural History, 11; miscellaneous, 6; total, 60. Remembering that we have no endowed chairs of Natural History or Philosophy, and but a limited number of workers, the Society is to be congratulated on such substantial results; and when we remember what considerable additions have been made to the lists of species, more particularly of land and marine shells, and what extensive tracts in the west are either imperfectly examined, or not yet examined at all, we may reasonably hope that the harvest is far from being exhausted. Certainly, as regards Geology, it cannot be so; not only is the exact place in geological sequence of some of our formations still undetermined, but there are some thousands of square miles which have not been, and cannot be, interrogated, so long as they are hidden by a dense forest growth. And it *seems* as if this broken fragment of the great Australian

Continent, or of some of the lands of a great archipelago, were destined to throw a light on the history of the whole, which it will take many years' study to bring to a focus.

*The late Mr. Gunn.*—Our Society, gentlemen, has sustained great losses, to some of which, as already noticed by the Council, it is needless for me to refer. I may, however, remind you of the very recent death of the late Mr. Ronald Campbell Gunn, who for nearly half a century did honour to this and earlier societies. The infirmities which attended the close of his career prevented my ever having the pleasure of making his acquaintance, but I allow myself to quote from the pen of his illustrious friend and fellow-worker, Sir Joseph Hooker, the tribute his scientific labours had earned twenty years ago:—"Ronald Campbell Gunn, F.R.S. and L.S., to whose labours the Tasmanian Flora is so largely indebted, was the friend and companion of the late Mr. Lawrence, from whom he imbibed his love of botany. Between 1832 and 1850, Mr. Gunn collected indefatigably over a great portion of Tasmania, but especially at Circular Head, Emu Bay, Rocky Cape, the Asbestos and Hampshire Hills, Western Mountains, Flinders, and other islands in Bass' Straits, the East Coast, the whole Valley of the Derwent, from its sources to Recherche Bay, the lake districts of St. Clair, Echo, Arthur Lakes, and the country westward of them to Macquarie Harbour, and the Franklin and Huon rivers. There are few Tasmanian plants Mr. Gunn has not seen alive, noted their habits in a living state, and collected large suites of specimens with singular tact and judgment. These have all been transmitted to England in perfect preservation, and are accompanied by notes that display remarkable powers of observation, and a facility for seizing important characters in the physiognomy of plants such as few experienced botanists possess." "I had the pleasure," continues Sir J. Hooker, "of making Mr. Gunn's acquaintance at Hobart, in 1840, and am indebted to him for nearly all I know of the districts I then visited; for we either studied together in the field or in his library; or when he could not accompany me himself, he directed one of his servants, who was an experienced guide and plant collector, to accompany me, and take charge of my specimens. I can recall no happier weeks of my various wanderings over the globe than those spent with Mr. Gunn, collecting in the Tasmanian mountains and forests, or studying our plants in his library, with the works of our predecessors, Labillardière and Brown."* Such men are not too often met with in any community, and are rarely honoured as they deserve until they are gone. We can at least offer the expression of our respect and high appreciation *to the friends he has left.*

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* *"Flora Tasmaniæ," I., p. cxxv.*

*Recent Inventions.*—Residents in Hobart are already familiar with one of the most surprising of recent discoveries—I mean the power of conveying the sounds and tones of the human voice to great distances by means of the telephone—through its daily employment for many months past in communication between the city and signal station at Mount Nelson, a distance of six or seven miles. It is, perhaps, not so generally known that conversation has been held, although with difficulty, between Hobart and Low Heads, at the mouth of the Tamar, a distance of 160 miles. The facility with which we accept these discoveries, and almost cease to wonder at them, is itself not the least remarkable feature of our times. We are losing a sense of the limits of possibility in nature, and are as ready to believe the most incredible things, if they wear the garb of science, as our ancestors were in their simple and child-like ignorance. A very few years probably will elapse before telegraph poles will form a necessary accompaniment of every road, and civilised men will communicate verbally at a distance as habitually as we now do face to face. Involving, in fact, as the instruments in use here do, the application of the microphone, we have two philosophical instruments of great complexity, and full of instruction, at our command: a mind that can clearly follow and fully comprehend the principles of their construction, the functions of their several currents, has learned much of physics, and of physics in a direction of ever widening application. It is to be regretted that we have no physical lectures; and here, I think, the State might step in, not by the endowment of any chair, but by the provision of such honorariums to be placed at the disposal of this Society as would induce competent persons to give them the intellectual pleasure, and the distinction attending them being a large part of the reward. The time and trouble involved, and usually the expenses of preparing diagrams, illustrations, models, and apparatus, quite preclude most persons, not being professors or professed lecturers, from imparting their knowledge in this way. I can scarcely pass this subject without alluding to two applications of the fertile discovery of Professor Graham Bell, which must have quickened in many minds an intense desire to witness them—I mean that beautiful but costly toy, the phonograph, which I have heard reproduce an Italian song, on turning a handle, in the exact tones of the singer; and, more recent still, the discovery by which light itself is made instrumental to the transmission or reproduction of sound — the photophone. This instrument, as you are aware, depends upon the peculiar property of selenium, which is not a conductor of electricity *in general, to become an imperfect one when fused and cooled slowly. Another property* is required, which it also has been found to possess. Its resistance to electricity is much reduced by the action of light; a selenium pile being then interposed in an electric circuit, and a beam of light of varying intensity being made to fall upon it, the current is more or less resisted in proportion to that intensity. The light is made to vary by the effect of the voice in rendering the diaphragm of a telephone more or less convex or concave, and thus sounds have been reproduced at distances up to 800ft. It is not, however, as a substitute for the ordinary telephone that this beautiful instrument is likely to be of value, but for its applications in rendering molecular vibrations audible wherever they occur, opening up quite a new field of experimental research. It is not necessary for me to enlarge on these subjects. The sources of popular information on all these inventions are numerous, and ample to satisfy curiosity; what is rather wanted, perhaps, is the curiosity itself. I mean an active-minded interest in such subjects, to be created by systematic instruction; and here I must remark that I much approved of a suggestion that one of the Tasmanian Scholarships should occasionally be awarded to attainments in mathematics and physics, with only a pass qualification in classics, if we cannot afford to add to their number. Competent teachers would soon be forthcoming. From such students the colony would in time be furnished with mining, telegraph, and other engineers, surveyors of a high class, well-educated men, in fact, in many departments of applied science, for whom it must have a demand, as its industries develop, and who are not turned out from existing schools.

*Mr. Crooke's Researches.*—At the risk of exhausting your patience, I must allude to one other field of new research, appealing to the imagination, and amazing the spectator more perhaps than telephones or photophones,—I mean Mr. William Crooke's researches* into what he has denominated the ultra-gaseous state of matter. That an absolute vacuum is a thing no art or apparatus can produce, is of course acknowledged. What must then happen when something so near a vacuum is produced that the gaseous pressure within a glass vessel is reduced to a few thousandths of an inch? It follows that the atoms still remaining will disperse, and fill the whole space, not of necessity at equal distances, but at greatly augmented distances from each other. The denser they may be in any one part—as where they are attracted to the walls of the enclosure—the sparser must they be in other parts. These invisible atoms, moving among themselves at inconceivable velocities, can be made to manifest their pressure to the eye: and as a skilful blacksmith can heat a rod of iron red hot by hammering it, so can they be made to heat a piece of platinum foil red hot by impinging upon it off a reflector properly disposed. Into the field of physics and dynamics opened by these exquisite experiments, by which I have seen the Royal Society of London almost entranced; into the behaviour of these bodies under the influence of electric or magnetic currents, I am not in the least competent to enter. I only refer to them as matters as new, as they are profoundly interesting; and suggestive of our own need for physical instruction to keep up with the discoveries of the day.

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* *Vol. 30, Proc. R. Soc., 1879,* p. 469.

*The Survey Department.*—To pass to what is more germane to our business. It is, I think, from this Society that the responsible guides of public affairs may reasonably expect to hear from time to time of subjects whose importance, being scientific rather than political, is not likely to be pressed upon them by outside interest. Among these I venture to name the imperfection of our county maps, especially those which include new mineral districts, and the poverty of the topographical information they convey. Indeed, I must go a step further, and say that from a scientific point of view, the organisation of our Survey department cannot be pronounced satisfactory. The office of Surveyor-General being merged in that of Minister of Lands and Works, there is no longer a professional chief to direct and combine the work of the numerous district surveyors discharging duties of great present, and still greater future, importance. Under such circumstances, it will be no wonder if serious discrepancies are found to exist hereafter between surveys of different dates, or that we ask in vain for a good map of the country within 20 miles of Hobart. The maps accompanying Mr. Gould's Geological Reports give more detail than the county maps; but besides being mere sketches, and of a fragmentary character, they are scarcely to be procured. These reports I find scattered through no less than twelve bulky volumes of Parliamentary papers, and it appears to me that the time has come for collecting and reprinting them in a more convenient form.

*Meteorological Returns.*—The advancing years and infirmities of our Fellow, Mr. Francis Abbott, F.R.A.S., have, as the Society was informed by the last report of the Council, led to the discontinuance of the meteorological register kept by him for the long term of 35 years, an instance of self-devotion and gratuitous service to science which it would be hard to surpass. The only register now regularly kept that I know of, except those at the lighthouses, is that of Mr. W. E. Shoobridge, at New Norfolk, commenced in 1874. We are much behind other colonies in this respect. Meteorology requires more and more a multiplication of observations. The excessive humidity of our climate on the West Coast has not, I think, been done justice to. It is stated that the rainfall at Macquarie Harbour exceeds 100in.* It averaged 67in. on the Hampshire Hills, 1837-9,† and in one year exceeded 80in. How much of this is due to the vast forests which still clothe that region, covering 5000 or 6000 square miles, and how much to permanent physical conditions, cannot now be guessed, but it is of considerable importance to ascertain the facts before any material change is effected in the aspect of the country by settlement. With regard to these instruments which only require attention once a day, such as registering thermometers and rain-gauges, I cannot imagine that there would be any difficulty in multiplying them. In some colonies, as, for example, Canada, use is made of the masters of the common schools, who are highly intelligent men, very stationary, and can all be instructed; and I am disposed to recommend, as a beginning, the provision of instruments for instructional purposes at the Central School. Attention was pointedly called, as you are aware, at the Intercolonial Meteorological Conference, held at Sydney in November, 1879, to the importance of this colony in relation to weather telegrams. I have reason to believe that we shall shortly be invited to take part in a general plan of intercolonial observation, receiving and interchanging them, and otherwise contributing our share to a species of Australian confederation, which can alarm no susceptibilities and arouse no jealousies.

Gentlemen, I feel that I have taken up a great deal of your time, and have said very little; I have only now to thank you for the kindness and attention with which you have listened to me.

## NOTES SHOWING THAT THE ESTUARY OF THE DERWENT WAS OCCUPIED BY A FRESH-WATER LAKE DURING THE TERTIARY PERIOD.

By R. M. Johnston, F.L.S., etc.

[*Read* 12*th April*, 1881.]

Apart from the circumstance that the extensive tertiary fluviatile and lacustrine formations of Australia have been the principal sources from which we have derived our rich treasures of gold and tin in the free state, their study from a naturalist's point of view is also peculiarly interesting from the nearness of their deposition to our own time.

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* *"Wallace," p. 244.*

† "Backhouse," p. 126.

The greater opportunities to examine the immediate features of one's own neighbourhood, to some extent, determine the direction of our studies in any branch of natural history, and thus, perhaps, my residence for ten years in Launceston—itself cradled in the undulations of an old tertiary mudbank—may have had something to do with my choice of a subject for this evening.

Many present may have noticed along the shores of the Derwent, particularly in the neighbourhood of Sandy Bay, One Tree Point, and Cornelian Bay, a series of sandy and clayey beds sometimes of considerable thickness and extent.

They frequently dip irregularly at various angles, and in various directions, as if they had been much disturbed subsequent to their deposition, but they are never found at an altitude of much more than 40 feet above the existing sea level.

The sandy portions, in some places, may readily be mistaken for members of the older or primary rocks, but they are invariably closely associated with thinly-bedded clays—white, yellow, and grey,—and they are coarsely granular and irregularly bedded.

The clays, on the contrary, are generally most regularly and thinly bedded like the sheets of a huge volume. Now if we examine any one of these beds a little more closely, we may discern that it is in turn composed of innumerable filmy leaves, finer than the most delicately prepared paper, all in the plane of the lines of bedding. I have purposely drawn the parallel with a book, for, like it, each of the clayey pages are crowded with characters—Nature's own handwriting, telling many an interesting story of the times when they were impressed and deposited beneath the waters of this ancient lake; while the rifts, contortions, crinklings, overlying rocks and drifts, and the waste of the ever encroaching sea, tell of the vicissitudes to which the beds have been subjected subsequently. Since my recent arrival here, I have spent much time in studying their characters, and I have carefully traced their extent by inspecting every foot of coast line, watercourse, railway and road cuttings, and natural faces exposed, within a seven mile radius of this City. My acquaintance with the "solitary patch of limestone" at Geilston, which is still quarried by Mr. Albury, and of the old limestone quarry at the head of Burnett-street, to which I was at one time guided by Mr. Legrand, enabled me to decipher their signs more readily.

Indeed many of the characters of the leaf and fruit remains, are identical with those found so abundantly in similar lacustrine formations throughout Australia and Tasmania, the *relations* of which with the Geilston Travertin I have already discussed most fully before the members of this Society,[*] and which have subsequently received additional illustration in the interesting paper by Dr. Barnard, in respect of the vegetable drifts of Gulgong. In order that I may establish the characters, relations, and position of this interesting formation, which indeed lies within as well as around the fair city of Hobart, I shall perhaps be enabled to do so more effectually if, in the first place, I confine myself to a description of the principal sections as they occur at particular places, some of which I have already referred to, viz:—One Tree Point, Sandy Bay, Cornelian Bay, Pipe Clay Bluff, Prince of Wales' Bay, Beauty Bay, Lindisfarne Bay, Geilston Bay, and the neighbourhood of Burnet-street, Hobart. It will be seen upon the Map which has been kindly prepared for me by Mr. Frank Lovett that, on the one hand, all the points lie within the basin, and are subject to the wasting advance of the waters of the existing estuary; while, on the other hand, they abut against the older rocks, and the eruptive diabase represented by Mount Nelson, Knocklofty, the Domain, Mount Direction, the lofty ridge terminating in Point Rosny, and the more distant but majestic crest of Mount Wellington.

These latter diabasic rocks constitute the chief characters, and have rendered famous the features of our neighbourhood, and they surround both city and the formation being described, as with a great encircling arm.

The formation at One Tree Point lies at the base of Mount Nelson. It forms a gentle eminence of a triangular shape, whose base, washed by the Derwent, stretches from opposite Sandy Bay Point to a creek which runs into the Derwent nearly opposite Trywork Point, while its apex lies between two hollows which radiate from that elevated saddle which forms so conspicuous a feature beyond the Flagstaff Station, at Mount Nelson.

A section underneath the new defence works on the Brown's River road presents the following appearance, which, with some of the leaf figures, have been graphically sketched for me on a larger scale by my friend Mr. F. Salier. *(See Plate 1.)*

The beds marked *a. b.* dip at a considerable angle to the south-east in the direction of the existing channel. Were it not that the laminæ in the plane of bedding are rich in certain well-known tertiary leaf impressions, the appearance of some of the lower members of the group, which include a motley assortment of coarse and huge angular blocks, principally of the fossiliferous mudstone of Palæozoic age, would be apt to mislead, and perhaps may have hitherto misled the casual observer.

[*] *Proc. Roy. Soc.*, 1879.

The latter included blocks, huge, irregular, and tilted at all angles, so as to obscure, if not conceal, the true lines of bedding, are very puzzling; but, if we accept a conclusion which is forced upon us from independent considerations, we can easily conceive how the otherwise regular lines of bedding with the true sedimentary laminæ may be harmonised with the included angular blocks of a previous age.

I have already observed that one of the limits of the base of the formation was opposite Sandy Bay Point. There, on the Brown's River road, a section exists, clearly showing the older mudstone rock *in situ*, against which the upper members of the tertiary lacustrine formation may be seen to abut. *(See Plate 2.)*

Now all who have travelled along the Huon Road, or who have sailed under the cliffs at Bedlam Walls, must at times have been struck with the regularity of the beds of the older mudstone series as they lie over each other in vertical sections, and quarrymen at the new battery at Kangaroo Point will tell you how easily one of the layers may be separated from the adjoining one. Some of the layers, however, are of softer texture than the rest, and consequently a wall of such rock must wear away unequally. The rocky cliffs below the Shot Tower are good illustrations of this unequal waste of certain beds. At this spot there may be seen the rapid destruction of a softer layer at the sea level, which, when far enough advanced, will cause, as it has already done, the fall of immense faces of the superincumbent mass, which, by degrees will, by wind-driven waves of terrific force, be strewed as angular blocks among the finer sands of the advancing sea.

Now, if we assume that the ancient tertiary lake here spoken of had an extensive surface, of which, from other sources, there are proofs almost amounting to demonstration, we can readily conceive how the strewn angular blocks of fossiliferous mudstone at *a*, fig. 1, came to be included among the more regularly stratified clays and sands, and associated with the fruit and leaf impressions of a later age. Nay, more, the assumption thus forced upon us will enable the observer, as it enabled me, to anticipate in great measure what other observations in the neighbourhood can verify and amplify.

Let not the over-cautious, therefore, frown upon anticipations of this kind, for in truth they are the half-lights or the natural fruits of former observations, and when recognised as such they constitute the more valuable part of that inestimable possession which Professor Tyndall has happily designated the "Scientific Use of the Imagination." From *this momentary digression* let us again turn to our section as exposed at One Tree Point. The overlying basalt marked *c*, is essentially a dark, close-grained, feldspar basalt, with abundant grains and crystals of olivine. It is full of small fragments, scarcely altered, of the surrounding stratified rocks. The rock itself is in every respect very similar to the basalts at Deloraine, Breadalbane, Table Cape, Geilston, Campbell Town, Ringarooma, Latrobe, Fingal, and various places in Victoria, in nearly all of which places it overlies fluviatile and lacustrine formations similar to that at One Tree Point. Towards the south the basalt seems to have flowed in repeated layers at different times. This may be inferred also from the marked difference in the form and density of the various sheets. The flows of basalt to the south, which I assume to be the more recent, are very unlike the massive beds at the northern point of junction with the underlying clays. At certain points towards the creek southward, they are highly vesicular, and present very much the appearance of pumice stone, although of a more dense character. This also is the character of the soft underlying feldspar basalts of Beauty Bay, Lindisfarne Bay, and Cornelian Bay, good sections of which may be seen at low water all round the sea margin.

The feldspar basalt on the northern and western shores of Prince of Wales' Bay is identical with that at Cornelian Bay, but the cavities are filled with lime, and is thus converted into a true amygdaloid. It is very curious that all the great basaltic sheets of Tasmania and Australia of tertiary age should be so closely associated with the great fresh-water systems of the period; and it is also worthy of note that the mode by which they were ejected was probably by fissure-eruption, and not by the more familiar type of conical volcano. The immense level sheets of basalt in the Midland and Northern districts of Tasmania, together with the vast plains composed of similar basaltic sheets in Victoria, support the views recently advanced by Professor Geikie,* who states positively upon the subject, that the volcanism of earlier periods as exhibited in the great sheets of the Western States of America, Abyssinia, India, and elsewhere, can with difficulty be explained by reference to any modern volcanic phenomena.

The persistent horizontality of the tertiary basalts in Tasmania and Victoria, also offer strong reasons in favour of the fissure-eruption theory.

With respect to the flows at One Tree Point there is another interesting feature, which, if correctly interpreted, proves that there were repeated flows of basalt also at the point where the rocks are most crystalline and homogeneous in character. This evidence consists of the discovery of bone breccia in what I believe to be the cooling joints of an older sheet of basalt. From close personal examination of the bones *in situ*, and from replies made by Mr. Moore, the intelligent overseer of defence works,—who first, through Mr. Roblin, drew my attention to the "bone discovery"—I feel assured that the bone breccia was washed into the cooling joints of an older sheet of basalt, and was subsequently overlaid by another flow.

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* *Nature, November, 1880.*

Unfortunately the bones are so broken up that they are of little service in determining the exact nature of the animals to which they belonged. Mr. Roblin, however, by careful pulverization of some of the fragments of breccia, among other undetermined matter, obtained a small well-preserved tooth, which undoubtedly belonged to a marsupial of the genus Hypsiprymnus, or Kangaroo Rat family. I also succeeded in obtaining one or two bones of interest, among which is the well-preserved incisor of a marsupial allied to the existing Wombat.

I have made enlarged drawings of the more important fragments, which probably at some future time may be serviceable at least in correlating the existence of the same animal elsewhere, even if of little value in determining its exact specific rank. The bones obtained by the late Mr. Morton Allport from the Geilston travertin are most probably the remains of the same species.

It would be interesting to make comparisons with the collections referred to, but I fear they have not been preserved. It will be remembered by some that Mr. Allport and others at first inclined to the opinion that the fragments of bones preserved at Geilston belonged to existing species, but this opinion was formed at a time when the relative position of the travertin beds was not very clearly understood. It is probable that the bone remains could only be identified with existing genera, and that there is not sufficient evidence to declare specifically their exact nature. However, some of the members present may be able to give us further information regarding this matter.

Before leaving the section at One Tree Point, it is desirable to draw particular attention to the fault at *d*, fig. 1. It is evident that by the fault *d*, the beds *a* and *b* have again been thrown up, so that we have, in travelling towards Kingston, a repetition of the section *e* to *d*. Between *e*, fig. 1, and the northerly limit opposite Sandy Bay Point, *c*, fig. 2, there is evidence that considerable denudation has taken place, and consequently we are unable to fix, with satisfaction, the probable thickness of the stratified sands and clays at this point. The overlying sheet of basalt is only about 6ft. thick at the extreme point, but becomes massive, probably from repeated flows, towards the west.

The observations which I was enabled to make regarding the conditions under which the One Tree Point leaf beds were deposited, predisposed me to expect that in the protected bays on either shore of the estuary at a similar level I should find further evidences of the lake system, which even then I had reason to infer must have included the Geilston travertin, which I now regard as a deposit formed in a small bay of this old lake. In this respect my expectations were more than realised, for in carefully examining the coast lines at the first three points I selected for examination, viz., Sandy Bay, Cornelian Bay, Lindisfarne Bay, I discovered sections proving their close relationship, even more remarkable than that at One Tree Point, which first arrested my attention.

### SANDY BAY DEPOSITS.

At Sandy Bay there are several interesting sections belonging to the formation. One of them, beyond Dunkley's Point on the Brown's River road, is composed of a series of clayey and arenaceous beds, irregularly disposed about 30 to 40 feet high. It is capped by what appears to be a tufaceous loamy soil. The surface of this loamy bank, like many other points on either side of the Derwent, is covered with a layer of the comminuted remains of existing marine shells, about 1 foot in thickness. The shells appear to have been subjected to fire, for which also there is evidence in the abundance of wood-ashes and charred remains of timber belonging to existing vegetation which enveloped the shells.

The best and most interesting section at Sandy Bay is to be seen at a small projecting sandy promontory nearly opposite the new Rifle Range. At this point a series of finely bedded blue and reddish clays more or less arenaceous are tilted at a very high angle against a thick-bedded reddish sandstone of doubtful age. There appears to be a fault at the point where the clays are inclined at a very high angle against the sandstone, and it is evident that a strong lateral pressure has bent them up into their present form. When we take into consideration the eruptive disturbances subsequent to their deposition, of which, in their vicinity, I have already given evidence, we may reasonably expect considerable crumplings and fractures of this kind.

Sketch 3 gives in outline the principal features, and the relations of this section. *(See Plate No. 3.)*

The fine blue and red clays *b* are extremely rich in fossil leaf impressions, *but as the purer* clays are often very soft, *and the sandy beds friable, it is* difficult to get perfect specimens. The forms common to One Tree Point, Geilston, Pipe Clay Bluff, Burnet-street, and elsewhere, are found here in the greatest abundance (see figs. 1, 34.)

The sapindaceous-like form so common about Launceston, is also found throughout the local formations where the beds have been exposed. Between the sandy point referred to, and the elevated diabasic bluff to the north against which the fossiliferous clayey beds are again seen to repose, there is evidence of the great thickness of the system, although the denudation, which has been great, together with superficial drifts, have obscured the junction with the series to the southward. There is every reason for the belief that the district known as Sandy Bay proper was almost altogether beneath the waters of this ancient lake.

### PIPECLAY BLUFF, CORNELIAN BAY.

The next important section illustrative of the nature and extent of the system is to be found in Cornelian Bay, at a place called the Pipeclay Bluff. The beds at this place are nearly horizontal, and they quietly repose upon the Domain diabase at a short distance beyond a small gravelly point which juts out into the bay. The lower members are composed of a fine whitish pipeclay, which is sometimes used by the poorer classes as a whitewash. These clays are readily reduced to a milky state in water, and have most probably been derived from the waste of the white mudstone rocks of palæozoic age, which abound in the immediate neighbourhood, *e.g.*, Geilston. It is in these white clayey beds where the leaf impressions of many extinct species of trees are most perfect and abundant. The impression of the fine secondary veinlets of the leaves are preserved with faithful delicacy. The impression of fruit valves are also seen occasionally. I have on several occasions obtained the casts of *Pleisiocapparis leptocelyphis*, *F.V.M.*, both here and at One Tree Point. This particular fruit is very common on the opposite shore in the Geilston travertin beds. There is no doubt of the identity of some of the leaf forms with those found at Breadalbane and Muddy Creek on the Tamar, while their relations with all the local leaf deposits, which I believe to be members of the same lake system, are so abundant as to place the matter beyond reasonable dispute. The upper members of the Pipeclay Bluff series are of a more arenaceous character, and they are coloured red with the surface water from the diabase above on the Domain.

They are, however, rich in similar leaf impressions, though of course less perfectly preserved.

The sketch 4, although not drawn to scale, gives a fair idea of the section at this point. It is most probable that had not denudation scooped away the beds in the direction of Cornelian Bay Cemetery we could trace the clays as they dipped under the basalt at Cornelian Bay Cemetery Bluff. *(See Plate No. 4.)*

The basalt sheets at Cornelian Bay Cemetery are soft, vesicular, and sometimes disposed in hexagonal columns in the exposed vertical faces. There is scarcely any doubt but that the similar sheets, at a short distance across the estuary, (*i.e.*, at Beauty and Lindisfarne Bays), were at a recent period connected. It is also probable that the soft vesicular masses at Cornelian Bay bear the same relation to the more dense and crystalline sheet overlying the travertin at Geilston as the dense and porous sheets at One Tree Point already described. The basaltic sheets to the north and west of Prince of Wales' Bay are also mostly vesicular. Most frequently the cavities are filled with lime, and are thus converted into true amygdaloids.

The best illustration of the extent of the pebbly drifts overlying the basalts may be seen at Lindisfarne Bay on the seaward margin of His Honor Mr. Justice Dobson's property, of which No. 5 is a sketch. *(See Plate No. 5.)*

The water-worn pebble beds are sometimes of considerable thickness. The pebbles have been derived from various sources :—Fossil pines silicified from the coal measure sandstones, fossiliferous water-worn blocks from the palæozoic mudstones, waterworn boulders of diabase of secondary age, feldspathic basalt from the underlying rock, and fossilized trunks of a well-known exogenous tree of tertiary age, evidently silicified *in situ.* The appearance of the latter wood, rough, angular, not worn, presents a marked contrast when compared with the polished water-worn silicified pines and other pebbles from the older rocks. The sections of the fossil wood of tertiary age under the microscope appear to be identical in every respect with similar sections obtained by me from kindred deposits near Little Badger Corner, Flinders' Island, and also at Corra Lynn, Launceston.

### SHELL BEDS.

I have also shown that the pebbly beds occur in the same position relative to the basalt on the opposite western shore, and some of them with the shelly deposits at Cornelian Bay have already received attention. Mr. Wintle, who is a very intelligent observer, has drawn attention to them on several occasions. Some of his interesting observations have already been discussed before the members of this Society. In one of them he has correctly shown that the agates, cornelians, and *jaspers, so abundant* around the beautiful

Cornelian Bay, have been derived from the waste of the older gravel drifts which overly the basalt.

Mr. Wintle inferred that the pebbly beds with the overlying surface layer of comminuted shells, and the underlying basalt, were upheaved at a recent period from the bed of the existing estuarine sea. That the shelly accumulations are in reality indications of a "raised sea beach."

The comminuted shells which are all of existing littoral species, (viz. *Ostrea edulis*, *Mytilus latus*, *Venus aphrodinoides*, *Rupellaria diemenensis*, *Risella melanostoma*, *Littorina unifasciata* · *Trochocochlea constricta*, *etc.*, *etc.)*, favour this very natural conception.

My acquaintance with the undoubted raised sea beaches of the islands in Bass' Straits, and along our northern coasts, predisposed me to concur with Mr. Wintle's view of the question prior to my discovery of the true relation of the basalts with the tertiary leaf beds at the various points already described in this paper. But a careful examination of the shell beds themselves from Blackman's Bay to Rosetta Crossing on the western side, and from Geilston to Frederick Henry Bay on the eastern shore, has convinced me that the views of the late Mr. Gunn, the most illustrious among Tasmanian naturalists, are most in accord with all the facts which are now known to me. You are all aware of the close observing powers possessed by the late Mr. Gunn, and the many opportunities which he had of making observations as regards the life and habits of the aboriginal tribes which frequented the coasts, especially the sheltered coves and beautiful headlands of the Derwent and Tamar. I cannot do better than give a description of their shell feasts in his own words:—

In a paper contained in vol. 2 of the Tasmanian Journal of Science, 1845, to which my attention was first specially directed by Mr. Calder, after preliminary remarks regarding the shell heaps, Mr. Gunn goes on to say:—"I was led to infer, at first, that they had been artificially and recently applied as manure. It was not until long after when I had an opportunity of observing some lately formed heaps of shells on the West Coast of the island that I ascertained the truth. As some persons otherwise well informed still believe that changes in the relative levels of land and sea may have led to the appearance of the shells in their present places, I have thought it best to record my observations on the subject. The aborigines of Tasmania appear at all times to have derived a considerable portion of their food from the sea, and* as they seem to have no effectual means of catching

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Calder states, that in their wild state they did not eat scale fish.

fish in any quantity, the testaceæ and crustaceæ constituted the principal and almost only supply they drew from that element.

From the reports of early navigators, it would seem that the aborigines existed in considerable numbers along the coast of Tasmania; and we may thence infer that the consumption of shell-fish must have been very great, as they ate no vegetables or substitute for bread. In cooking, the shells appear in all instances to have been merely roasted in the simplest manner, as I have never traced any indications of ovens or stones arranged to be heated. The burning of the shells has hastened their decay. In obtaining the shell-fish the women were, I believe, almost exclusively employed, wherever diving was requisite, as for the species of haliotis and oyster, these being brought to the surface in baskets formed from various sedge-leaved plants.

In the majority of cases they consumed their food as near as possible to their fishing stations; occasionally going a little inland to avail themselves of a spring or stream of fresh water. I have, however, observed in a great many instances that there were unusually large accumulations of shells on projecting points, headlands, and places commanding extensive views, whence I suppose that they adopted these sites for their repasts to protect them from the attacks of hostile tribes."

He elsewhere describes that the heaps of comminuted shells are various in extent and thickness, and invariably burnt and intermingled with charcoal, etc.

In corroboration, I have to offer the following observations:—

1. Wherever the shells are found undisturbed by recent landslips,* I have found them always more or less comminuted with a burnt-like appearance—unlike the northern raised beaches—and enveloped in what appears to be ashes, for they are invariably full of the charred embers of the wood of existing trees.

2. At Pipeclay Bluff, Lindisfarne, New Town Bay, and elsewhere, I have frequently found the ordinary rude chipped flints of the natives intimately associated with the shells. I have given samples of these flints to His Excellency the Governor Sir John Lefroy, and to His Honor Mr. Justice Dobson, who will be able to testify as to their genuineness so far as they are chipped native flints. I have also dug out from the undisturbed beds the split bones of existing marsupials, which appear also to have undergone roasting.

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* The section which Mr. Wintle refers to is due, I believe, to the subsequent re-distribution of landslips caused by the encroaching waves at Sandy Bay.

The shelly layers invariably follow the irregularities of the surface along the coast line upon a vegetable loam irrespective of level. The layers are very irregular in thickness and extent. On favourite promontories of the natives, such as New Town Bay Point, the burnt heaps are over four feet thick.

4. Inland where the levels, free and open, are far under the undisturbed heights at which the shelly layers frequently are found along the coast, I have never found traces of the shells anywhere at or near the surface. This would not be the case if there were an upheaval sufficient to have raised the shells along the estuary to their present position.

5. The gravelly and pebbly beds have evidently been distributed by fresh water, most probably at a period long anterior to the introduction of the existing marine fauna, because in my opinion they contain remains of an extinct tertiary vegetation *in situ;* and I have never been able to trace any recent or marine shells in their beds.

6. Extensive isolated patches occur, in every respect identical in character, at such heights upon the Domain as to make it difficult to conceive that they were deposited there by other than human agency.

7. Frequently where the surface soil gives evidence of having been least subject to aërial erosion the shelly accumulations suddenly cease entirely, to reappear again and again in such a manner as would be difficult to account for if we supposed they were produced in the bottom of a shallow estuary, or at any limit within the influence of its waters.

8. The accumulations are certainly not due to the agency of winds.

Taking all these points into consideration I think it is clear that the accumulations are solely due to human agency; that they are in reality, as described by Mr. Gunn, the "kitchen middens" of the extinct Tasmanians. That they are vast in extent and thickness along our estuaries is to be expected when we consider how much this rude people depended upon the marine shells for subsistence. It must be borne in mind also that the Tasmanian race, from an ethnological point of view, must have existed for countless generations upon the island; for otherwise how can we account for the marked racial type when compared with the natives of the Australian mainland and elsewhere? I think therefore that I am justified in separating the surface shell layer from the underlying gravels and drifts as shown in sections 4 and 5.

The latter I conceive to be the upper members of the lacustrine deposit of tertiary age; the former, an artificial accumulation belonging to the existing period.*

It may be well now to summarise some of the leading features of the system with which, in detail, I have endeavoured to make you familiar.

If in imagination we carry ourselves far back to the epoch which immediately preceded the reign of the eucalypts, when the Araucaria and Cinnamon trees graced the slopes of the neighbouring hills, we might from some commanding eminence (such as Mount Nelson) look down upon a magnificent sheet of water at our feet which would, in a general way, resemble in outline the existing estuary of the Derwent. With a few minor exceptions its sinuous boundaries would follow the same lines, but its waters would be fresh, and the Domain and Trinity Hill would be almost isolated in their midst. The great features of the surrounding country, Mount Wellington, Mount Nelson, Knocklofty, The Gunner's Quoin, Mount Direction, would be almost unchanged. On a stormy day we might also see its surface broken into crested waves; and in the neighbourhood of One Tree Point and Geilston we might watch how the chalky-looking cliffs of mudstone rock were undermined and crushed by their repeated blows, and also see the milky sediment the result of such waste as it was floated away to eventually settle in the quieter waters of the sheltering bays.

The vegetation which luxuriously fringed its shores would appear new, although its general features would not strike us as being altogether unfamiliar.

The botanist would find, instead of the sombre gum and the green wattle, a large number of trees with elm-like leaves and walnut-like fruits with 4 and 5 valves. In the slopes of the bay near Geilston a species of Araucaria (A. Johnstonii), like A. Cunninghami, would rear its curiously imbricated branches crowned with their singular spiny cones. If we searched among the dead wood in the shady places we should find an abundance of strange land shells (Helix Huxleyana, H. Geilstonensis, Bulimus Gunnii), one of which a larger species (Helix Tasmaniensis) would be specially interesting in the eyes of a conchologist. At times our imaginary conchologist might espie, however, a single individual whom he would recognise as an old acquaintance (Helix Sinclairi). It is even possible that no fresh-water Unio would be found to inhabit the waters of the lake; and thus it would exhibit a similar relation to that which at present distinguishes the northern and southern waters of Tasmania. Of the higher animals we can only conjecture, but we are at least sure that many of the marsupial tribe, allied to the existing Wallaby and Kangaroo Rat, abounded in the scrub close by.

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* Having examined a number of the shell heaps near Hobart, I have no doubt whatever of their artificial character. They resemble shell heaps that I have seen along the Atlantic and Pacific Coasts of America, which were deposited *by the Indians living on the coasts*.—W. Denton.

This imaginary scene may fairly be taken to represent what we know of the earliest stage of this ancient lake of the Derwent, which I consider to belong to the same horizon as the lower zone of the Launceston Tertiary Basin.

The second stage is indicated by the disturbances caused by repeated eruptions of feldspathic basalt along the margin of the old lake, and spreading over a portion of its floor. Cornelian Bay Cemetery and One Tree Point represent this stage clearly. It is evident that a very long period must have elapsed between the formation of the first sedimentary deposit of the lake and the period when the eruptions began. It is also clear that the period of disturbance must have been of long duration. The Sandy Bay deposits are good illustrations of the first period referred to. The second stage I recognise as the equivalent of the middle zone of the Launceston Tertiary Basin.

The third stage marks the distribution of the gravel beds with their agates, jaspers, cornelians, and fossil woods. At this time the lake must have been rapidly shallowing. It is even possible that the mere horizontal advance of the sea is alone necessary to explain the final draining of this ancient fresh-water system. If the outer lip of this lake basin was pierced by the slowly advancing sea, it would sufficiently account for all the appearances with which I am now acquainted.

There is no need to assume a general depression of the land surface or a subsequent elevation, although I do not wish to be understood to mean that a slight alteration of the general level may not have been associated with the causes already cited.

The horizontal encroachment of the sea in the direction of its present limits must have been very slow, and long enough in duration to admit of a complete transformation of the characteristic flora and fauna of the period.

When we reflect that the changes which take place within our own observation, with respect to existing animals and plants, are so slow and imperceptible that many otherwise intelligent minds have a rooted repugnance to recognise the facts which support the evolution hypothesis, we can, even better than in terms of years, estimate the immensity of time which separates the extinct species of vegetation of even the upper members of the lake system from the artificial shelly accumulations of recent origin which now alone remain to give evidence of the extinct Tasmanian race.

*Such then is the* story which I have been enabled to decipher from the clayey pages of this old lake of the Derwent. There are, however, myriads of leaves still uncut, unread, and I trust the members of this Society will assist in the future in adding to our knowledge regarding them.

## DESCRIPTION OF TWO NEW MARINE SHELLS DREDGED OFF THREE HUT POINT, D'ENTRECASTEAUX CHANNEL, TASMANIA.

By C. E. Beddome.

[*Read* 10*th May*, 1881.]

**Delphinula Johnstoni**, n.s.

Shell minute, obliquely turbinate, nucleus smooth, whorls 3½ to 4, convex, latticed by spiral and diagonally transverse liræ; spiral liræ alternately fine and coarse, increasing in number towards aperture; base convex, the surface of which is also finely latticed; there is a well-defined, relatively broad, and somewhat concave band, transversely lirate, between last spiral liræ and the tortuous marginal rib of umbilicus, which latter joins and forms a partly closed channel at anterior angle of aperture. Aperture round, outer lip simple, obsoletely channelled at anterior and posterior angles. Inner lip reflexed and nearly concealing umbilicus and marginal rib.—Long. 2 mil. Lat. 2 mil.

This shell is closely allied to *D. tetragonostoma*, Tenison-Woods (fossil sp.), and forms an interesting link with the marine life of the tertiary period.

Hab., off Three Hut Point, D'Entrecasteaux channel, about 17 fathoms.

I have great pleasure in dedicating this species to my friend R. M. Johnston, Esq., who has interested himself so much in the present and past fauna of the country.

**Leda Lefroyi**, n.s.

Shell minute, thin, translucent, much compressed, narrowly elongate. Under the lens the exterior surface appears finely striated, radiately and concentrically, and is covered with a very delicate olive epidermis. Anterior side short, arched; posterior side with a gently curved depression, and produced into a long, narrow, tapering rostrum, which, upon the inside, is divided into two well-defined channels by a raised longitudinal callosity in both valves. Rostral area scarcely truncated at the tip. Umboes slightly elevated. Ventral margin slightly convex. Long. 9½ mil. (a line *passing vertically* through umboes would divide the length thus: anterior side 3 mil., post. 6½ mil.) Depth 4 mil., thickness of both valves 1½ mil. Teeth, post. 22, anterior 11.

This interesting shell is very distinct from any known species. It approaches the Patagonian Leda (L. Patagonica D'Orb.) in form, but it is much smaller and is sculptured differently.

Hab., off Three Hut Point, D'Entrecasteaux Channel, 10 fathoms.

I dedicate this species to His Excellency Lieut.-General Sir John Henry Lefroy, K.C.M.G., who has always taken an active interest in matters appertaining to natural history.

## SUGGESTIONS FOR AN EXTENDED ELUCIDATION OF THE PLANTS OF TASMANIA.

By Baron Ferd. Von Mueller, K.C.M.G., M.D., F.R.S.

[*Read 10th May*, 1881.]

The rich and beautiful vegetation of Tasmania has had bestowed on its special investigation the talent of a leading phytographer of this age, Sir Joseph Hooker; and no other island of the same dimension can boast of the possession of two such superb volumes on its vegetation as the Flora Tasmanica, issued at the expense of the Admiralty with some support of the Local Government. The di- and mono- cotyledonous plants became thus mainly, though not exhaustively enumerated; very many also of the Acotyledoneæ, by the aid of Messrs. W. Wilson, M. Mitten, M. J. Berkeley, W. H. Harvey, and C. Babington, became largely recorded, so much so that in 1860, when the second volume of the Flora Tasmanica appeared, already over one thousand well-defined Cryptogams, exclusive of ferns, became recorded; thus, to Tasmania belongs the honour of having laid the foundation to the whole cryptogamic botany of Australia, a great majority of the Tasmanian species (as shown by subsequent and even previous researches) occurring in continental Australia also. Nevertheless our knowledge of the Acotyledoneæ of the Tasmanian colony must not by any means be regarded as complete; indeed, these lower vegetable organisms have there almost solely been collected by Messrs. Gunn and Archer, with a zeal beyond praise, through which their names will also in this department of science be for ever identified with the land of their adoption. Many regions within the Tasmanian dominion were not accessible to either of these investigators, *and it is* very likely that numerous species of Acotyledoneæ of the mainland of Australia could yet be traced into areas of Tasmania; now nearly 3,000 species of Cryptogams being known from extra-tropical Australia, a large share of these from collections formed by myself and by contributing friends since 1847. While to the phanerogamic flora of Tasmania it is not likely any very large access will be gained, unless from King's and Flinders' Islands, and the smaller isles of Bass' Straits, it may be predicted with confidence that the number of mosses, lichens, and algæ of Tasmania will be still considerably augmented by assiduous and persevering searches, and the number of fungi hitherto on record (and to which absolutely nothing has been added since Gunn's and Archer's exertions) might yet be doubled, if not even tripled. It is then to the fungi particularly that I would draw the attention of Tasmanian collectors, inasmuch as unlike the phanerogamic flora, the mycologic treasures of any country remain almost inexhaustible, fungi of many kinds occurring only at long intervals, at particular seasons, for very short whiles, and under capricious circumstances, whereas also frequently additions to the fungus-flora will occur by reason of the subtility of spores adherent to articles imported by trans-oceanic commerce. Thus, a fruitful field for research in this direction is still open also in Tasmania; and I would invoke the kind aid of any settlers who have taste for science, to gather, around their homes or in their travels, any kind of fungus which at any particular time may appear in any special locality. The process of drying fungi, even the brittle and succulent mushrooms of various kinds, is not difficult; such plants require merely to be placed near a fire, suspended in a little calico bag or net, after being sprinkled with kerosene to prevent the development of insects in the specimens. If some talented hand, especially that of ladies, will furnish coloured drawings along with the dried samples, the value of the collection would become greatly enhanced.

In these times of great efforts for general education each civilised country is striving to obtain a complete record of its natural productions; and the study of plants with all its utilitarian advantages, and all the intelligent pleasures which it affords, is cultivated now almost in all European schools from books gradually arisen through original field-researches. To keep pace with the progress of times in this respect on the other side of the globe, it is sought to complete the Universal Australian Floral Records, in which fungi must play an important *rôle* also, not to speak of mosses, lichens, and algæ, apt to be overlooked by amateur collectors, without whose aid no exhaustive searches can be made. If we turn even to the vegetation of trees, shrubs, herbs, grasses, sedges, etc., it may be *assumed that about half a hundred* could yet be added to those known from the Tasmanian territory, especially if a collector purposely visited the isles north of the main island during the spring season. As this could be accomplished by a very small expenditure, I venture to express a hope that the enlightened legislature of Tasmania, which was never even called on to support the issue of the seven volumes of the Flora Australiensis by Mr. Bentham and myself, from 1862 till 1877, will think fit to identify itself with the progress of this extensive publication in its continuating and supplemental volumes now under elaboration.

## NOTES ON A SPECIES OF *EUCALYPTUS (E. HÆMASTOMA)* NOT HITHERTO RECORDED IN TASMANIA.

By T. Stephens, M.A., F.G.S.

[*Read* 10*th May*, 1881.]

Among the timber trees of this colony, a species of Eucalyptus, popularly known as the "gum-topped stringy bark," has long been familiar to saw mill proprietors and splitters; but through some strange oversight on the part of botanical collectors it has never hitherto been included in the Flora of Tasmania. Some two years ago, having been asked by a friend to ascertain its botanical name, I found that no tree answering its description had yet been scientifically recognised; and I at once sought the aid of friends in various parts of the island, requesting them to obtain specimens in flower for identification, but without success. In February last, I was fortunate enough to fall in with a well-grown tree in full blossom, specimens of which were forwarded to Baron Von Mueller with a result which will be best described by quoting from a letter which he has kindly forwarded me:—

"Your letter of 2nd April is before me concerning the Hemiphloious stringy bark tree, and after your lucid remark there can be no doubt that it is *Eucal. hæmastoma* of Sir James Smith, so that your circumspect exertions have been rewarded by the discovery of a species of Eucalyptus new to Tasmania. This species has latterly also been found in Gippsland, and I have been able to study more fully its characteristics. You could oblige me by noting the differences of the timber (as opportunity occurs), and also of the seedlings."

The chief peculiarity of this tree is that while the lower part of the butt is clothed with a thick fibrous bark closely resembling that of the common stringy bark (E. obliqua), the upper part, and the smaller limbs and branches, are quite smooth, whence its popular name. The timber is highly prized by splitters, and for general purposes it is described by many competent authorities as second only to the Blue Gum, though opinions seem to differ as to its durability. It is found in most parts of the Colony, and appears to grow as freely on the table land of the interior, reaching an altitude of not less than 3,000ft. above the sea, as along the coast line. The description of Eucalyptus hæmastoma in Bentham's Flora does not in all respects agree with the character of the tree as known in Tasmania, but the description will probably be revised by Baron Von Mueller.

## AURIFEROUS COUNTRY AND GOLD-BEARING ROCKS.

By Charles E. Barnard, M.D., F.L.S.

[*Read* 10*th May*, 1881.]

The subject of my paper is one that cannot fail to prove of interest to this Society, seeing the great importance the gold-mining industry is assuming, and has already assumed, in the colony of Tasmania.

The advantages to be gained by fostering this industry in the colony need scarcely be dilated upon by me, as they are so patent to any one who will take the trouble to examine into the causes of the vast progress the Eastern colonies of Australia have made during the past quarter century. The numerous large towns and villages that dot this portion of the continent—the majority of them founded upon, or connected in some way with, the discovery of gold in their immediate neighbourhood—speak for themselves; and the immense impetus to trade, commerce, and immigration which it brings about shows what mining will do for a country, hitherto in a state of almost primeval solitude. But for this source of wealth, the major portion of these colonies would still have remained in a "state of nature"—one huge sheep run, with but a sparse population and scattered country villages.

With the magic touch of gold, all is changed. Everywhere over the land the busy miner is found digging and delving, and bringing to light the vast stores of hidden wealth. He is the pioneer of civilisation. In the solitudes of mountain and forest he seeks the precious metal, and should Dame Fortune reward his eager search by placing in his reach the long-sought-for golden treasure, the scene at once changes. Soon there springs up, as if *by enchantment, first* a village, which then gradually merges into a town as wealth succeeds wealth, and afterwards into a city, with all the comforts of life, and the culture of the civilised world.

For such a comparatively sparsely inhabited country as Tasmania, nothing then could be more advantageous than a large development of its gold-mining industry. True, she has other minerals in abundance besides gold; but no other metal presents such attractions to the ordinary miner. For in alluvial mining, the gold can be won without costly appliances and with merely unskilled labour. Any man who can handle a pick and shovel can go gold mining, and provided he "prospects" in "auriferous" country success is not unlikely to attend him. And so it is important to know by what indications country shows itself to be auriferous. In this continent gold is widely disseminated over a vast extent of country, and almost every day- fresh deposits in newly prospected districts are being discovered, as is lately instanced by the recent finding of gold in the interior of New South Wales, near its N.W. corner.

The aspect of auriferous country somewhat varies in different districts. Usually one sees groups of rounded hills, gentle undulations, and broad valleys between the hills, with creeks and rivers here and there. The soil is generally excellent, as is evidenced by the large forest trees and abundant grass.

Upon going over this country and examining the hills and outcropping rocks, one almost invariably finds the same characteristic features. The rocks are usually of a slaty character, tilted up into a more or less vertical position, and with a strike approaching N. and S. Close by are seen plutonic rocks, as granite, diorite, porphyry, etc., which are evidently the cause of the vertical position of the slates by intrusive action. Besides the slates, we find hills composed almost entirely of conglomerates, with beds of limestone and sandstone interspersed ; and here and there we come upon long, low, narrow, rounded ridges, covered with dark rich soil, gently rising from its bed. These prove to be of volcanic basalt, which has flowed down the ancient valleys and watercourses from some Pliocene crater. Everywhere strewn around we come upon boulders of quartz of various sizes, which have become detached from the parent rock, lying hidden amongst the slates and granites.

The shaly rocks are found to vary in character, according to their position relative to the plutonic rocks. Some are soft and argillaceous, or of a sub-crystalline nature ; others have become hard and silicious from the infiltration of silica in a state of solution through their substance. Others, again, are of a more crystalline character, and are called micaceous, talcose, or chloritic, according to the prevalence of the chief ingredient. No fossils can be seen in these slates even under the microscope, but their age has been proved to be lower Palœozoic by associated fossiliferous sandstones and limestones. It is of great importance to note the age of the sedimentary strata; for in this continent the richest goldfields are found to be those whose out-cropping rocks are of Silurian age, with intrusive dykes of granite and greenstone. But gold-bearing rocks are not always necessarily confined to one particular age, as is evidenced in America, where auriferous quartz has been proved to be associated with later formations than the Silurian and Devonian.

Gold has evidently been deposited in common with other metals throughout all ages, even up to the present time. In Australia, though we find it associated only with the past, its deposition was co-existent with the dawn of creation of animal life. It belongs to the age of Invertebrata, when the inhabitants of the seas consisted only of echinoderms, trilobites, bivalves, cephalopods, etc.

It was also the first great change of type in animal life, when endo-skeletal creatures were succeeding the exo-skeletal in the order of things and process of evolution, for the remains of the earliest fishes are found in the upper beds of the Silurian formation.

It was at this time, then, that during active igneous eruptions and intrusions gold and other minerals were brought into association with the shaly sedimentary strata of the Silurian and Lower Devonian systems.

Gold has also been found in sedimentary rocks belonging to the carboniferous formation: but no doubt in these cases the gold has been derived from the original auriferous rocks of the older systems. Its presence here, though, teaches us that it is not impossible to find it in any formation, especially when that formation is derived from the denudation of Silurian strata.

There is one feature about these auriferous formations that is characteristic; they are more or less crystalline or metamorphosed, probably from the action of heat under great pressure. But it is found that the less crystallised they are, the more auriferous they appear.

As regards the matrix of gold, quartz is almost universally the most prevalent. And wherever it occurs it is always in veins or reefs, occupying fissures and rents, either in the primary rocks, or in the plutonic intrusive dykes.

But gold is also found in other rocks besides quartz. Hornblendic granites and diorites, or a greenstone composed of hornblende and feldspar, are *most* commonly the source of the metal. *Serpentine, too, has been* worked profitably, and yielded it in abundance, even though the gold was not visible to the naked eye. But whenever these rocks are found in conjunction with Silurian slates, gold deposits may be confidently looked for, especially if quartz veins are found also in connection therewith.

It is by the disintegration and denudation of these rocks that alluvial drift becomes loaded with gold, which is washed down into the valleys and gullies below. And where the dykes of diorite or granite forms the bed rock of the "lead," the gold is generally in greatest abundance—it being retained or arrested in the joints and crevices of the denuded rock. On each side the drift or "wash" contains only the finer or less weighty particles.

The discovery of rich auriferous reefs is, in many instances, brought about by the removal of the overlying "wash" or drift; and some of the most flourishing reefing districts of the present time in Australia were originally only worked for the alluvial gold. When a reef is laid bare by the miner under these circumstances, there is by far greater likelihood for it to be payably auriferous than otherwise, and the richness of the overlying drift is in a measure a test of that of the vein of quartz thus exposed. So every alluvial miner is strongly advised to search diligently for hidden quartz veins in the bed-rock of his claim. The same, in fact, may be said of all mineral veins. The drift containing the mineral can only have been derived from some neighbouring vein, which probably, by "stripping," would be discovered if persevering attempts were made to search for it. Alluvial mining, then, leads to quartz-mining, and in the most successful instances is the only prelude to it. I recommend this fact to be noted by the capitalists of Tasmania, when contemplating investment in gold-mining; for I am afraid vast sums are spent in quartz reefs that can never be otherwise than unproductive. The most permanently payable auriferous reefs seldom contain gold alone, but are usually intermingled with iron and copper pyrites and other sulphides. Gold, too, is rarely found in a pure state, but almost invariably alloyed with a varying percentage of silver. Pyritous quartz is a good indication of the presence of gold; but in this case the precious metal is so tightly bound up in the sulphides as to be only with difficulty extracted therefrom. And it is a singular fact, that, frequently when gold is proved by chemical analysis to be present in this kind of stone in tolerably large proportion, none is visible on the surface to the naked eye. It is so finely divided, and so closely "held in bondage" by the pyrites, as to be rendered invisible. When this pyritous mineral is decomposed by a process of oxidation, the gold is then, and then only, liberated from its connection therewith. In these instances the quartz presents a porous or "honeycombed" appearance, and so rendered more easily workable. When gold is found in hard compact quartz veins, and is even quite visible thereon to the eye, as a rule these reefs are not always of a very permanent character.

In alluvial deposits the gold is also found associated with various minerals that have evidently been derived from the same mineral vein—such as platinum, magnetic iron, chrome iron, and tin oxide, as well as quartz, zircon, topaz, and even the diamond.

Miners, as a general rule, restrict their search to the one metal—gold, discarding all others that may appear in their "wash." So probably many valuable metals and precious stones are lost that otherwise could be saved with profit.

The occurrence of gold in quartz veins, and the presence of the quartz veins themselves in plutonic and metamorphic rocks, can be explained by chemical agency. The mineral veins must have been deposited during a very disturbed period; but subsequently to the intrusive action of the plutonic rocks, and the metamorphosis of the argillaceous strata contiguous thereto. Intense heat must have prevailed, while the semi-liquid fused masses uplifted, tilted up and transmuted the Silurian formations, forming dykes by cutting through them. During the contractions that must have ensued on cooling, fissures would be formed both in the intrusive dykes and the sedimentary rocks, which would generally be across the direction of the cooling mass. These fissures would then become filled with infiltrating hot solutions of silica and minerals. Upon further cooling the silica would be deposited and the minerals, including gold, would likewise be precipitated, or gradually crystallise, and become intermingled with the silica mass.

The solutions of these minerals would be effected in this way. During the prevalence of the intense heat that must have been everywhere cotemporary with the igneous action of the period, the temperature of all waters, vapours, and gases would rise excessively high by reason of the enormous pressure to which they would be subjected below at great depths. All would be chaos: every substance would be subjected to intense chemical agencies, and be continually undergoing change. The hot waters and vapours would be dissolving what was soluble, such as the alkalies, silica, and all the compounds of the metals. These latter would be formed by gases and acids of intense chemical activity that would be present, such as chlorine, sulphuretted hydrogen, nitric and hydrochloric acids. These would act and re-act upon all the minerals they came into *contact with, and the* compounds thus formed would become intermingled with the hot solution of silica; and so be deposited with it in whatever fissure it was poured into. It would thus appear as a mineral vein upon cooling.

The frequent appearance of gold in a finely divided state and enveloped in iron pyrites can also be accounted for by chemical action. When a solution of sulphate of iron comes into contact with a solution of gold, the latter is precipitated as a very fine powder of a dark colour, and the sulphate decomposed. Gold would be dissolved by the chlorine of the nitric and hydrochloric acids present or in its free state, while the sulphate of iron would be formed by the oxidation of the sulphide which is always so abundant. In this way the invisibility of gold when disguised by iron pyrites can be accounted for. But gold being volatile under very high pressure, and at a high temperature, could also be sublimed and condensed similarly to other metals which are conveyed in this way.

Besides the minerals, gold is found associated with remains of the animal and vegetable kingdoms. These, though of no commercial value, yet are of no less interest and importance. By their means the age of the auriferous drift can be relatively approximated, and when found over a large tract of country they can be compared with one another.

The animals whose bones and teeth are occasionally found belong entirely to the past. They evidently must have been of larger growth than is seen now. They comprise huge marsupials and immense birds. The fossil vegetable remains, as leaves, fruits, stems of trees, etc., also indicate an ancient flora that has almost entirely passed away. In a few instances some modern genera resemble those that are found fossil but only in a modified form. The majority of them belong to extinct genera; and all are of Tertiary age—probably pliocene or even miocene. As these organic remains have so frequently been found in auriferous alluvial drift, the miner in these colonies is encouraged to proceed in his search when he comes upon a layer of fossil leaves, fruits, etc., especially if these lie beneath Tertiary basalt.

During the pliocene period, this land must have been the scene of intense igneous action, as is evidenced by the immense flows of basalt that are met with throughout long stretches of country. The course of the ancient valleys and watercourses can be traced by observing the direction of the basalt; for as the semi-liquid lava would flow where there was least resistance, it would naturally take the easy descent down low-lying valleys and river-beds, and in this way they can be traced for miles. The miner, then, should not be *discouraged* or deterred from sinking by finding basaltic rock in his shaft, for there is every probability of "payable" auriferous wash being found beneath the massive layer.

In conclusion, while sincerely rejoicing at the prosperous condition of several of the gold mines of Tasmania, I cannot contemplate but with serious misgiving the "mining mania" that has apparently seized the Tasmanian public, especially in the North. Rash investments in mythical quartz reefs is not legitimate mining, and can only lead in many instances to disaster, as happened at Hill-end and Tambaroora, in New South Wales, some few years back.

I sincerely hope it will not be so; but would wish to see every confiding shareholder gladdened by dividends to his heart's content.

There can be no doubt that Tasmania has unbounded wealth in her mines; and I feel assured that in their development she has the means of rising, Phœnix-like, from the ashes of her former comparative poverty to a dazzling height of permanent prosperity.

## TYPE SPECIES OF TASMANIAN SHELLS UNRECORDED IN THE "CENSUS OF TASMANIAN SHELLS."

By Professor R. Tate, Assoc. Lin. Soc., F.G.S., &c.

[*Read* 14*th June*, 1881.]

Having, in the course of my researches in the bibliography of Australian Mollusca, noted that some specific names, founded on Tasmanian types, are not referred to in the conchological papers contained in recent issues of the Society's transactions, I have thought some utility may be served by their publication. They are not necessarily addenda to the "Census" by the Rev. J. E. Tenison-Woods, as it remains to be ascertained whether they are applicable or not to good species, and if to good species then whether they have priority or not over others already enumerated in the "Census." This task I relegate to the author—a "Revised Census."

To the following list I have appended references to the authorities for the specific names, and the localities of the type-specimens:—

**Columbella rosacea**, *Reeve*, Icon. Conc., (?)—*C. semiconvexa*. Tasmania.

**Cerithium Diemense**, *Quoy* and *Gaimard*, Voy. Astrolabe to 55, f. 11-13. Tasmania.

**Cerithium dubium**, *Sowerby*, Mes. Con., sp. 62; and *Reeve*, Icon. Con. t. 12, f. 78 (has priority over *C. monachus*, *Crosse*), Tasmania.

Hydrobia Gunnii, *Frauenfeld*, Zool. and Bot. Gess., Wien, xv., t. 8, 1865. Tasmania.

Amnicola Diemense, *Frauenfeld*, op. cit., t. 10. Tasmania.

Planorbis Australianus, *Martens*, Paetel. cat. der. Conch., p. 116, 1873. Tasmania.

Auricula Australis, op. cit. t. 13, f. 34-38 (*Syn. ophicardelus cornea*, Swainson). Hobart.

Mesodesma Diemensis, *Quoy and Gaimard*, op. cit., t. 82, f. 14-15. Hobart.

Tellina umbonella, *Lamarck*, an. s. vert. vi. p. 531, King's Island.

Corbicula brunnea, *Prime*, Proc. Acad., Sc. Philad., p. 126, 1861. Tasmania.

Arca semitorta, *Lamarck*, op. cit., p. 37. Tasmania.

Arca pistachia, *Lamarck*, p. cit., p. 41. King's Island.

Arca squamosa, *Lamarck*, op. cit., p. 45. King's Island.

Crenatula modiolaris, *Lamarck*, op. cit., p. 137. Maria Island.

Meleagrina alba, *Lamarck*, op. cit., p. 152. D'Entrecasteaux Channel, Tasmania.

The following have been published subsequent to the issue of the " Census " :—

Trochus Baudini, *Fischer*, Journ. de Conch., 1878. King's Island.

Pectundulus orbicularis, *Angas*, P. Z. S., 1879, p. 420, to 35, f. 9.—*P. flabellatus*, Woods. Bass' Straits, Tasmania.

## NOTES ON A SPECIES OF *ZIERIA* NEW TO TASMANIA.

By Augustus Simson, F.L.S.

[*Read* 14*th June*, 1881.]

*Zieria veronica*, F. Von Mueller, Trans. Phil. Soc., Victoria, i. p. 11., 1854.

I first discovered this addition to our list of the Tasmanian Flora in October, 1879, near the Ruby Tin Mining Company's, claim, George's Bay.

There were two small specimens, one bearing a blossom, growing in very light, sandy soil, in company with *Astroloma pinifolia*, and other more common plants.

I made it out to belong to the order *Rutaceæ*, but could not identify it with any of the Tasmanian species of that order, recorded in the Rev. Mr. Spicer's handbook, and felt sure that it was an addition to our Flora, if not altogether a new plant.

*Last October*, in travelling to George's Bay, I noticed a patch of the same plants. There were some dozens, all growing close together, about 150 yards from the George's Bay side of the Scamander Bridge.

I was unfortunately unable to obtain access to a copy of Bentham's Flora Australiensis, to assist me in identifying the plant, so sent specimens to Dr. Mueller by Mr. Thos. Stephens, and received from the Baron the identification given below.

As I had camped for some time near where I first found the plant, and on the day of finding it had had a good search round for more specimens, without success, I conclude it is of rare occurrence, especially as there are few spots near George's Bay, and along the road between Falmouth and George's Bay, which I have not frequently carefully searched for botanical specimens, without ever before finding it.

The largest specimens were about six inches in height; some but slightly branched, others like small dense shrubs.

Extract from Baron von Mueller's letter of the 9th May, 1881:—

"This most interesting addition to our collections of Tasmanian plants, now *Zieria veronica*, was already described by me in the transactions of the Phil. Soc. of Victoria i., p. 11, in 1854. This again shows, like the discovery of *Verbena officinalis* near Launceston, that even the localities near largely inhabited settlements in your main island are not yet exhaustively searched for plants: how much may thus yet turn up if the unsettled places in King's and Flinder's Islands together with your smaller isles become well searched, not to speak of interior portions of N.W. Tasmania, with its botanically almost unexplored alpine heights."

## THE IMPROVEMENT OF THE QUEEN'S DOMAIN.

By E. J. Crouch, M.R.C.S. Eng.

*Read 14th June*, 1881.

This is not the first time that the subject on which I intend to read a paper (namely, the Queen's Domain, and suggestions for its improvement) has been before your Society. I may mention that this matter was brought before your notice in the year 1875, when it was very warmly discussed by the public at that time, and several letters were read before your Society; still, I regret to say, very little has been done since then to beautify a spot that is certainly so well adapted to be a park and recreation ground for the people, though in 1880 light was once more thrown on the subject, for a petition was numerously signed by many influential citizens, and laid before the House, when, through the exertions of members of the same, the sum of £200 was voted for improvements in the Domain; still, nothing of any importance up to the present time has been done to effect the desired improvements. I, therefore, feel it my duty to again attempt to awake the interest of the public in this national undertaking, and hope that from any discussion which may take place after the reading of this paper some practical and lasting results will follow.

Among the minor improvements that have taken place this last year, I may mention the work done by prison labour in removing imbedded stones and levelling the ground in the neighbourhood of the Queen's Battery, together with the clearance of surface stones in other parts of the Domain. Another great improvement was the removal, or rather softening down, of the rugged quarry near the High School, which could be seen from most parts of the city of Hobart—I shall have reason to allude to this quarry in my remarks on improvements—and, lastly, the planting out of some young promising trees in the neighbourhood of the Royal Society's Gardens. This is certainly a step in the right direction, and augurs well for the future. Also the preventing of cattle from grazing in the Domain. I think that some modification of this will very likely have to take place, as the long grass will be liable in the summer months to accidental causes of fire.

I now bring before your notice some suggestions in regard to the future.

(1.) That a committee of the Royal Society be appointed to wait on the Minister of Lands and explain their views with regard to future improvements in the Domain, these to be carried out under their control, permission being given them to draw up a rough scheme or plan in order that all work connected with the improvement of the Queen's Domain might be done under a distinct system.

(2.) That such committee should receive an annual grant of, at the very least, £200 from Government. This sum was voted for improvement of the Domain only last session.

(3.) That the quarry in front of Government House be at once levelled in a similar manner to that already done near the High School, and arranged as a nursery, where plants, which might be received from the gardens or elsewhere, too young to be planted at once in the Domain, might be grown on until sufficiently strong to be removed.

*(4.) That prison labour* should at once commence near the

present drive round the Domain by removing the unsightly stumps and roots of trees; then trench and prepare any places capable of growing a variety of deciduous trees or shrubs ornamental in their character, such places having been previously pointed out by the committee. Subjoined is enumerated a list of deciduous trees which would be suitable for forming avenues, &c.:—*Ulmus campestris* (common English Elm), *Ulmus montana* (Broad-leaved or Mountain Elm), *Ulmus stricta* (upright growing, very beautiful), *Quercus rubra* (Red Oak), *Quercus lanciniata* (Cut-leaved Oak), *Quercus coccinia* (Scarlet Oak), *Quercus pedunculata* (common Oak), *Fagus sylvatica* (common Beech), *Fagus atro-rubus* (Dark Red Beech, or Copper Beech), *Æsculus hippocastanum* (Horse Chestnut), *Æsculus hippocastanum* (Scarlet Chestnut), *Betula alba* (White Birch), *Betula rubra* (Red Birch) *Platanus Orientalis* (Plane), *Platanus palmata* (Palm-leaved Plane).

(5.) Amongst special classes of plants for undergrowth, I would mention the varieties of Rhododendron, which grow freely, have fine foliage, propagate rapidly, and afford protection to indigenous and other birds. Whilst especially wishing for English and foreign foliage trees and plants, I, above all, would urge upon the Royal Society the necessity of making parts of the Domain typical of Tasmania generally. To follow out this idea, I would point out how attractive the rough uncared for sweetbriar vale above the gardens would be if properly arranged and planted with native shrubs, such as the Myrtle, Native Laurel, Blackwood, Sassafras, and others.

(6.) Another suggestion to render the present drives round the Domain more attractive, surface stones having been removed, would be to sow the ground to a certain distance back with a mixture of English grass and Dutch clover (white), and *Lotus corniculatus* and *Tormentilla reptans*, thus presenting a greensward to the passers-by.

(7.) Fine views might also be opened out by removing trees, thus forming avenues through which some of the most lovely scenery in the island might be viewed. As this affects the present generation, I look upon it as one of the most important suggestions, and in order that the best advice might be obtained to bring about this desirable end, I would propose that this Society should offer a premium for the most appropriate plans that might be prepared for the improvement of the Domain, such plans to become the property of the committee. A lithographic plan of the Domain should be supplied to applicants wishing to compete for the premium. This idea might induce local talent to come forward, and thus prevent us from crossing the water to receive advice.

(8.) That *prison labour should* commence making a road *from a point known as Chapman's* drive to wind round the that a donation and under the heading of "For improvements to Q be opened, to enable the citizens of Hobar generally to help forward this national under

In conclusion, I hope that by the next n of this Society the Domain Committee formed, a sketch plan approved of, and all tha able enlisted in this noble undertaking.

## ON THE QUESTION OF ESTABLISHI ROYAL SOCIETY'S GARDENS A CLA OR SYSTEMATIC ARRANGEMENT ILL THE CLASSIFICATION OF PLANTS TO THE NATURAL ORDERS.

By Thomas Stephens, M.A., F.G.S.,

[*Read* 8*th August*, 1881.]

Some three years ago I brought under the co the Council the question of setting apart a sn the Gardens, in a central position, for the selected plants, illustrating the principal Natur arranged according to their botanical classifica ime we had the advantage of the presence of the late received a letter from Dr. Agnew, giving an interesting account of a visit to the Botanic Gardens at Adelaide, and especially calling attention to a Class-ground, planned by Dr. Schomburgk, which he thought might be imitated, with necessary modifications, and on a more modest scale, in our own Gardens.

The following is Dr. Agnew's description, which he requested me to bring under the notice of the Council:—

"Round a centre, which may be a circular seat, &c., three zones or beds, each about 24ft. in width, are laid out. These zones are separated by narrow gravel walks, and each zone is subdivided into a great number of lesser beds, the proximal end of each being about 6ft. wide, the peripheral boundary or a segment of a larger circle being of course larger. Each of these little beds—6ft. by 24ft., more or less—is devoted to one Order in Botany, a bold label specifying the Order being displayed at the narrow proximal end. Possibly, square beds could be laid out more cheaply, but this plan, which is probably due to the mature experience of Dr. Schomburgk, is most convenient, as you can see so much in walking round the small central circle. No doubt, if required, Dr. Schomburgk would gladly give full particulars, and would also say if the whole was a success."

In reply to a request from the Council for further information, Dr. Schomburgk has kindly furnished a sketch plan, with a letter describing the general arrangement of the Class-grounds, which is hereto appended.

The question is now submitted for discussion by the Fellows of the Society. If they are of opinion that an attempt should be made to imitate, if only after a humble fashion, the example afforded by the Adelaide Gardens, not to mention innumerable other institutions of like character in other countries, the Council will no doubt do its best, with Mr. Abbott's advice and assistance, to give some practical effect to the scheme. It should be clearly understood that it is not proposed either to interfere in any way with the general plan of the Gardens, or to add to the cost of their annual maintenance. Only a small space is required, for in selecting plants care would be taken to choose only those which can be grown within narrow limits, and some Orders would not be represented at all. The work also could go on by slow degrees. The importance of encouraging the study of Botany by some practical teaching of this kind, a little of which will do more than a library of books, will be readily admitted; and a recognition of the fact that the Royal Society's Gardens are designed to afford some such educational facilities will certainly not lessen their claim to support at the cost of *the State.*

The following is the letter referred to :—

"I enclose a rough sketch of our Class-ground. A symmetrical figure has been chosen in order to afford an oversight over the whole.

"In the middle of the main walk a large basin with a fountain is built, which contains the aquatic plants of the Orders of the Nymphæaceæ, Vallisneriaceæ, Butomaceæ, Alismaceæ, &c.

"On both sides of this main walk extend the Monocotyledonous plants.

"The Class-ground represents 130 Orders by 750 Genera. Every Order is represented by from four to twelve Genera.

"The sequence of the Classes and Orders followed is that of the late Professor Adrien de Jussieu, son of Antoine-Laurent de Jussieu, the founder of the Natural Order of Plants.

"Every Order is divided from the other by a strip of green turf, bordered by narrow bricks, to prevent the spreading of the grass in the beds.

"Classes and Orders are written in conspicuous white letters on large square iron labels painted black; the names of the plants on smaller labels of the same colour. Only the sub-classes of the Dicotyledons are noted on the labels, viz., Polypetalæ, Monopetalæ, Monochlamydeæ, and Gymnospermeæ, &c., with an abbreviated explanation of the meaning of these names.

"It is almost an impossibility to lay out a system ground properly; it will and must be always deficient in completeness, especially in cooler climates. The representatives of a good many Orders being solely tropical plants, such Orders cannot be always represented. Another difficulty is also the selecting and grouping of the Genera of each Order, as some become large umbrageous trees, while others are only small shrubs, or perennials, and thus one will outgrow the other.

"I am sorry I have not one copy left of the plan of the Garden published in 1873.

"Hoping that this rough sketch will be of some use to you.

"T. SCHOMBURGK,

"Director."

# ON THE MAGNETIC VARIATION OF HOBART.

### By His Excellency Sir J. H. Lefroy, K.C.M.G., C.B., F.R.S.

*Read* 12*th Sept.*, 1881.

It is, I believe, about 18 years since there has been determination of the magnetic variation here, at all events published. It may have been, and very probably was, observed by the American Transit of Venus Expedition in 1874; but, if so, it does not appear to have been published. The most recent authentic observation I can find is that of Dr. Geo. Neumeyer in April, 1863, as included in his "Results of the Magnetic Survey of the Colony of Victoria."* He made it 10deg. 25·15min. E.

Dr. Neumeyer's station appears to have been in the field to the south of the approach to Government House. He describes the spot as 9·4 chains, or 206yds., south of the former Observatory, and S. 4deg. 27·76min. E. of it.

Captain J. H. Kay, R.N., the former director of the Observatory, made it 9deg. 57·2min. E., reduced to mean scale reading, for the mean epoch January 1, 1843, and inferred the annual rate of increase to be 1·46min., at which rate it should have been 10deg. 26·8min. E. in April, 1863, and 10deg. 52·7min. E. in January last.

I make it a considerably less quantity, and the inference is that it has passed its maximum amount, and is now somewhat rapidly decreasing. The annual rate of change from 1843 to 1863 was, in fact, rather more rapid than Captain Kay supposed, being 1·9min.

My observations have been made with a 4in. prismatic compass, the property of Kew Observatory. The limb is divided to degrees on silver. It has one directing magnet, and is a good instrument of the kind, although inferior to the declinometers now carried by scientific travellers. Moreover, I have laboured under the disadvantage of not knowing my time with absolute accuracy. I have been in the habit of setting my watch, a good lever one with compensation balance, by Mr. Abbott's regulator, which is kept to time I am told by transits, and I do not think it has in these observations been many seconds from the truth. I hope, therefore, that while individual results differ more than I could wish, the mean of the whole may be relied upon.

The following are my results:—They were observed on the site of the Observatory of 1840-1848, which appears to have been judiciously selected as free from local effects. The sandstone here crops out, forming an island surrounded by basalt, which, however, does not approach within 100yds., and is then of moderate thickness.

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* *Mannheim. J. Schneider, 1869,* 4to.

OBSERVATIONS OF MAGNETIC VARIATION AT THE HOBARTON OBSERVATORY OF 1841-8, EACH THE MEAN OF 5 SIGHTS.

| 1881. | Time. | | | Variations E. | | | Diff. from mean. | |
|---|---|---|---|---|---|---|---|---|
| | | No. | Hour. | Obsv'd. | Corrd. | Corrd. | E. | W. |
| | | | h. m. | ° ′ | ′ | ° ′ | | ′ |
| Jan. 10.. | P.M. | I. | 6 4 | 8 25·3 | — 1·9 | 8 23·4 | — | 25·9 |
| ,, | ,, | II. | 6 9 | 8 21·8 | — 1·9 | 8 19·9 | — | 20 9 |
| ,, | ,, | III. | 6 15 | 8 36·2 | — 1·9 | 8 34·3 | — | 15·0 |
| ,, | ,, | IV. | 6 20 | 8 54·0 | — 1·8 | 8 52·2 | 2·9 | — |
| ,, | ,, | V. | 6 25 | 8 52·0 | — 1·8 | 8 50·2 | 0·9 | — |
| March 22 | A.M. | I. | 8 36 | 8 49·3 | + 3·5 | 8 52·8 | 3·5 | — |
| ,, | ,, | II. | 8 38 | 8 56·4 | + 3·5 | 8 59·9 | 10·6 | — |
| April 4*.. | A.M. | I. | 8 50 | 9 34·0 | + 2·7 | 9 36·7 | 47·4 | — |
| April 16* | P.M. | I. | 3 3 | 8 46·8 | — 4·1 | 8 42·7 | — | 6 6 |
| April 18* | A.M. | I. | 8 36 | 8 59·0 | + 2·5 | 9 1·5 | 12·2 | — |
| Sept. 9... | P.M. | I. | 4 39 | 8 42·6 | — 2 8 | 8 39·8 | — | 9·5 |
| Sept. 10* | A.M. | I. | 8 8 | 8 36·6 | + 2·3 | 8 38 9 | — | 10·4 |
| ,, | ,, | II. | 8 17 | 8 59·6 | + 2·6 | 9 2·2 | 12·9 | — |
| ,, | ,, | III. | 8 32 | 8 54·5 | + 2·8 | 8 57·3 | 8·0 | — |
| | | | | | | 8 49·3 | | |

* These were observed by Mr. G. A. Lefroy.

I think there must have been an error in the time on the 4th April, and it was not observed on quite the same spot as the rest, but I do not feel at liberty to omit the observation. The rest are very fairly accordant. As we know the diurnal movement here, I have applied the proper correction. The mean of the whole is 8deg. 49·3min. east.

Being desirous of ascertaining whether any local influence could be supposed to cause the variation at the Observatory to be less than it should be, I repeated the observations at Lady Franklin's Museum, and at, or near, the Cascades Brewery.* These two stations were selected as likely to show the influence of the massive basaltic formation capping Mount Wellington, if it is capable of exerting any at two miles distant. The bold cliffs called the Organ Pipes bear about W. 60deg. S. from the Museum, and W. 15deg. S. from the Brewery. These stations are about two miles apart, with hills between them. Mean of two sets on the 22nd January at the Museum, 8deg. 59min. S.E.; mean of four sets on the 28th January at the Brewery, 8deg. 35·0min. E. We have here concurrent evidence that the variation is considerably less than it must have been in 1863. To which I might add an observation at Port Arthur, taken on the 27th January, but, as it was a hurried one, I will only say that it also points to a decrease.†

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* In the field beyond, near the gate.

† The result was 10deg. 43·9min.

On comparing Dr. Neumeyer's chart for the epoch 1858-1864 with the revised curves of equal magnetic variation issued by the Admiralty about a year ago, we find strong evidence to the same effect. The Admiralty curves are a generalisation from a vast body of observations collected at the Hydrographer's Office, and may possibly not include any recent observations in Tasmania. Indeed, I have reason to know that they do not. Dr. Neumeyer's Hobarton curve of 10deg. 25min. E. for 1863, falls between the curves of 9deg. and 10deg. E. on this map, which is dated 1880, somewhere near 9deg. 45min. I have inserted these lines in a map which is on the table. We may gather from the whole evidence that the line of no variation, which cuts West Australia, is now moving eastward. Twenty years ago it was moving westward. I am indebted to Mr. Calder for an extremely curious extract from Tasman's journal, which proves that, in his time, it was far to the westward again. That great navigator notes, in December, 1642, "*when you come from west, and find the N. W. variation suddenly decrease, you may then look out for the land. Near the coast here the needle points due north.*"

That is to say, the line of no variation which at present cuts the parallel of 42deg. S., in 130deg. E., or thereabouts, was in 1642 very near the West Coast of Tasmania, and, therefore, fully 14deg. more easterly than it is now. The variation of the needle is a matter of greater practical consequence here than is generally supposed. The district surveyors throughout the colony, I am told, make use of compass bearings only—all grants of land are laid out by them ; all boundaries defined by them. Now, if I am thus informed correctly, any gentleman who may have had given to him in 1863 a line due N. as his boundary, if he ran it again by compass to-morrow, would find himself at the end of one mile, 50 yards off the line.

This consideration will show plainly that the compass ought never to be trusted for such purposes. There are many other considerations which point to the necessity of putting the surveys of this colony upon a different basis. I alluded to this pointedly in my address to you in April last. I will only now express my full concurrence with the weighty opinion expressed, I observe, by our colleague and Vice-President, Mr. Stephens, in a correspondence just laid before Parliament,* that, " if it be long delayed inextricable confusion will be the probable, if not certain, result."

*Postscript.*—In the discussion which ensued upon this paper, one of the Fellows present remarked that the variation is still increasing at Melbourne, and I thought it due to the Royal

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* *Sessional paper, No. 101, New Map of Tasmania.*

Society to withhold the paper from publication until I could ascertain if such is the fact. I have pleasure in annexing an extract from a letter since received from Professor Ellery, dated September 19, which is conclusive to the contrary:—

"You will find your magnetical results nearly correct. The magnetic declination has been decreasing since 1865, roughly at the rate of 2min. per annum. In 1866 the declination was 8deg. 40min. E.; now it is 8deg. 6min. (Signed) Robt. J. Ellery."

As the variation at Melbourne was 8deg. 42min. in 1860, and 8deg. 40min. in 1866, we may take it as 8deg. 41min. in 1863, or 1deg. 44min. *less* than the variation at Hobart at that date. If my mean result is correct, the difference now is only 43min. It is, therefore, to be wished that the observations be repeated with a better instrument.

## REMARKS ON THE SCAMANDER GOLDFIELD.

By S. H. Wintle, F.L.S.

[*Read* 10*th Oct.*, 1881.]

The Scamander Goldfield, which was discovered about two years ago, is distant from George's Bay between 15 miles and 16 miles in a westerly direction. The country between the Bay on the N.E. and the Scamander River, where it is crossed by the bridle track to the Black Boy, consists of coarse porphyritic granite for the most part, and comprises the George's Bay tin-mining district in the County of Cornwall. A well-defined boundary, separating the granite from the older palæozoic formations, is formed, for a distance of some miles, by the Scamander River. Indeed, so well defined is the line of demarcation that at the north-eastern confines of the Goldfield the granite occupies the fording* place on one side without any sedimentary rock being visible *in situ*, while on the opposite side of the river, a distance of not more than 20 yards, no granite whatever is seen, it being completely covered up by palæozoic sedimentary rock, consisting of hard, cherty, altered sandstone, which in places assumes a slightly gneissose character. This, in turn, in the higher ground, gives place to very laminated, fissile clay schists or slate, so highly inclined as to be almost vertical. The Goldfield is situated at the head of Scamander River, in a valley bounded on three sides by very steep, lofty hills of slate, having a mean angle of about 40deg. As far as is known at the present time, the auriferous area is limited in

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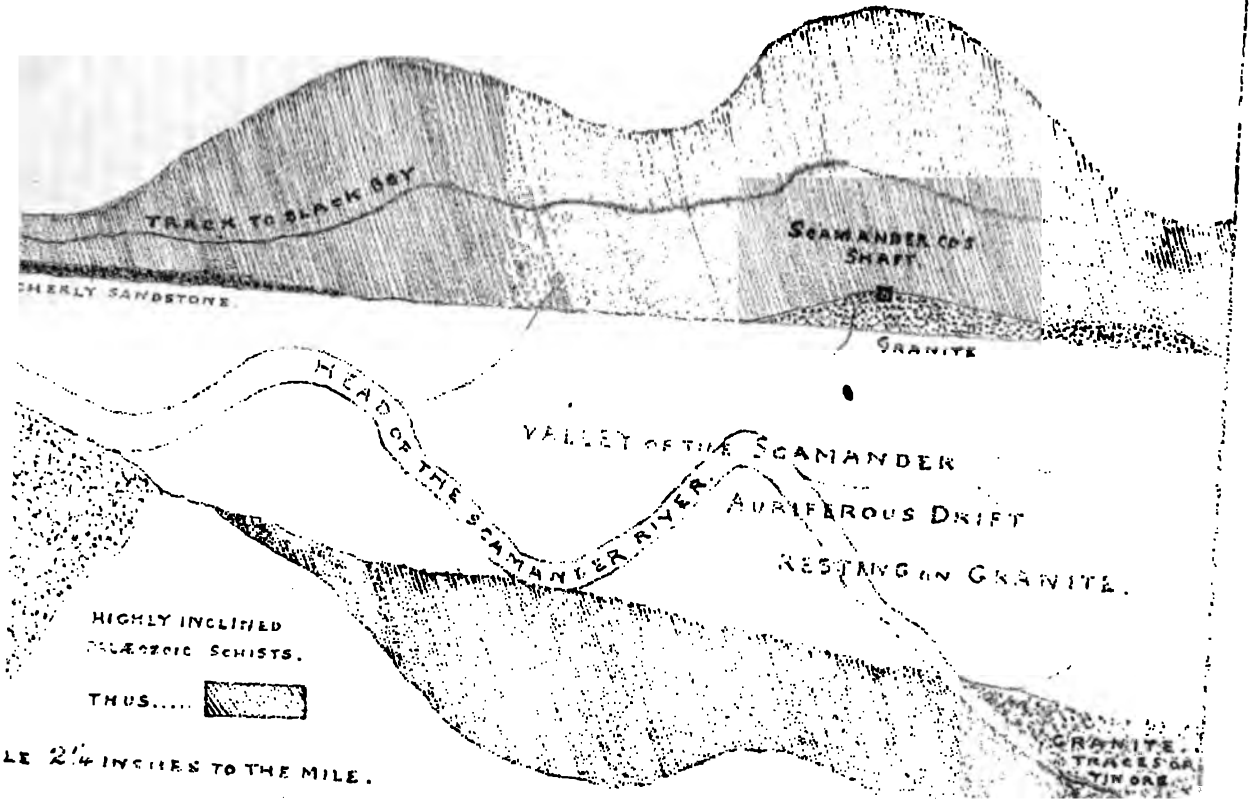
* See sketch plan.

## TCH PLAN OF THE SCAMANDER GOLD FIELD.



extent, for at a distance of about 3½ miles from the granite country at its north-eastern boundary, and at the fountain head of the river a syenitic granite again obtains, with small quantities of tin ore in the bed of the streams, and in the gullies, but with hardly any traces of Gold associated. All along the course of the river, from the fording place on the Black Boy track, Gold can be obtained in the drift at a mean depth of four feet from the surface, but those who worked the river bed in places, and its tributaries, failed to make it pay, notwithstanding that the Gold is coarse as a rule, pieces having been obtained of several pennyweights. As it is almost impossible to wash a dish of dirt and not get several specks of Gold, I am of opinion that the failure to make the alluvial operations remunerative is to be ascribed more to the mode of working, and the appliances employed, than to the poverty of the washdirt. This alluvial Gold has been derived from veins and lodes which traverse the hills near their base in conjunction with the granite, for at the base of these hills the palæozoic slate and sandstone appear to have no great thickness. In many places where trenches have been cut through these sedimentary strata in searching for quartz lodes, the granite, in a much decomposed state, has been reached at a few feet. The slate and sandstone in the hills is ramified by a reticulation of small quartz veins and strings, many of which are rich in Gold, and as a consequence the surface of the country is covered to a considerable extent with detached fragments of quartz. In the Scamander Company's claim a rich vein of auriferous quartz has been exposed. It traverses both granite and slate (See specimen No. 1). The quartz is highly charged with arseniurets and sulphurets of iron, and frequently with galena, which is argentiferous. The granite in this locality has, without any doubt, been erupted subsequent to the deposition of the stratified formations reposing upon it as elsewhere in Tasmania, although I am aware that one observer, at least, entertains an opposite view with regard to the granite in the Ben Lomond district. The fact of the quartz reefs traversing both granite and overlying sedimentary formations, is, to my mind, of exceeding interest, inasmuch as it affords proof that such lodes or reefs having a subsequent origin would imply a greater antiquity for the granite of this part of the island than I was inclined to ascribe to it. As far as my observations have extended, and which have been conducted on three different occasions, I find that the quartz lode is smaller or " pinched " where it traverses the slate " country " than the same vein is where it runs through the decomposed granite. In the Scamander Company's shaft, which is down about 30ft. in *soft, decomposed granite* (See specimen No. 2), the lode is nearly thrice the size it is in the slate about 15 yards away; but whether it will maintain its present size, or increase it at a greater depth where the granite will assume the crystalline condition, or pinch, can only be ascertained by future operations. At the present depth the granite begins to assume the crystalline character; large, rounded blocks, which have escaped decomposition by exfoliation, having been brought to the surface. The quartz at this depth, for the shaft has been sunk on the vein, is from 10in. to 12in. wide, and a recent mortar crushing in Launceston gave the satisfactory yield of 4½ ounces of Gold to the ton. The Gold is plainly visible in nearly every piece of quartz, and I never crushed a piece without obtaining an excellent prospect.

Comparatively little prospecting has been done in this district; not more than nine 10-acre sections have been applied for, and consequently comparatively little is known of the extent of the auriferous country. I am of opinion that it will eventually be found to be a moderately extensive Goldfield; and append a rough sketch plan of the locality.

## NOTES ON LEONTOPODIUM CATIPES.

By Baron von Mueller, K.C.M.G., M.D., F.R.S.

[*Read* 15*th Nov.*, 1881.]

In instituting recently a census of the genera of the whole Australian vegetation, I had to give to the remarkable alpine plant, first described by De Candolle as Gnaphalium catipes, a generic place also, its position thus far having never yet been firmly settled. Examining the plant first from localities in the Victorian Alps, I placed it in Antennaria, and described it as A. nubigena already in 1854 (Transact. Phil. Soc. of Victoria, i., 45), alluding already to the likelihood of its identity with Gunn's plant, sent by Lindley to the elder De Candolle; but I had no Tasmanian specimens at that time to establish its sameness with the one of the Australian Alps. In assigning to it a position among the species of Antennaria, I was careful to point out at once that it did not altogether accord with the characteristics of the legitimate congeners, our plant not being strictly diœcious. Indeed I was then already considering whether it ought not to find its most appropriate place in Leontopodium, notwithstanding the generally solitary capitula, and the biformity of the flower heads. To overcome the difficulty which presented itself, I *framed* a subgenus "Actina" for the reception of Antennaria nubigena, with the following characteristics:—"Scales of involucre radiating. Heads of the fertile plants, with several rows of female flowers in circumference, and with hermaphrodite ones in the centre. Heads of the sterile plants with only hermaphrodite flowers, a few rarely fertile, pappus at the extremity clavellate, with the exception of that of the female flowers, which is not thickened."

This subgeneric notation implied that the plant showed an approach to diœcism, thus paving the way from Antennaria to Leontopodium. A few years later Sir Joseph Hooker transferred this plant to his genus Raoulia (Fl. Tasm. i., 206, t. lviii.), and in this he is followed by Bentham (Fl. Austr. iii., 651), both, it seems, having only occasion to examine that state of the plant in which the bisexual but often sterile flowers prevail, whereas De Candolle had before him only the other state of the plant, with chiefly female flowers in the capitulum, the latter being figured in my "Plants of the colony of Victoria" (Plate xlv., fig. 4., the other at fig. 3), the pappus of both showing also considerable dissimilarity. Although we now know that the prevalence of the female or of the bisexual flowers is one of degree only, still there is a distinct dimorphism, and this same disparity seems to occur also in the genus Leontopodium, so much so, that in 1876 Mr. C. B. Clarke, when describing Leontopodium alpinum from the Indian Alps (Compositæ Indicæ, p. 100), notes not only heterogamous, but also distinct male and female capitula in the same glomerule. The accuracy of this observation I was able to confirm on Sikkim and Tibet specimens from Hooker and Thomson, and some Siberian samples from Turczaninow; moreover Sir Joseph Hooker also records last year in the generic character of Leontopodium "heads uni- and bi-sexual" (Flora of British India, part viii., p. 278). Hence there can be no doubt that Antennaria leontopodina (D.C. Prodr. vi., 269), obtained by Royle from Western India, though omitted by Hooker, and also by Clarke, is a diœcious state of Leontopodium alpinum. The opinion of Weddell (Chloris Andina i., 150), foreshadowed by myself, that Leontopodium should merge into Antennaria, though not countenanced by Bentham (B. & J. H. Gen. pl. ii., 303), deserves every consideration; but as additional species, likely yet to be discovered, and the re-examination of others, as yet only known in one of the states of dimorphism, may affirm hereafter the separation by R. Brown of Leontopodium from Antennaria, I deem it best to bring now the Gnaphalium or Raoulia Catipes to Leontopodium, by which means an interesting connection of an alpine plant of Tasmania and South-eastern Australia with the famous "Edelweiss" of Europe and Asia is established; moreover I am convinced that some

Raoulias of New Zealand will have to be transferred likewise to Leontopodium, notably the somewhat dimorphic R. glabra. Sir J. Hooker also alluding already (Handbook of the New Zealand Flora, i., 151) to the affinity of allied plants, placed by him into Gnaphalium, to Leontopodium. If it is desirable to maintain the multiplication of the genera of this group of Composites, then Anaphalis will claim also attention as regards the generic position of Leontopodium Catipes, especially as the involucre scales are radiating, though the general habit as well as the setæ of the pappus, free at the base, form but notes of trifling generic value. Finally it may be observed that Antennaria might become an apt point of generic concentration of the several allied plants with strictly universal capitula, while Leontopodium might receive those cognate genera in which the diœcism is only imperfectly expressed.

I avail myself of this opportunity, while speaking of Tasmanian Composites, simultaneously to point out that Leptorhynchus nitidulus has this year been refound there, it not having been gathered by anyone since R. Brown visited the island in the beginning of this century. The new locality is Glenorchy, where it was obtained by Mr. Aug. Simson, and where probably other Gippsland plants may be found yet. Bentham thought to recognise in it the L. linearis of Lessing, which Steetz however rightly kept apart (Lehm. pl. Preiss. i., 450), although my anticipation proved correct, that L. linearis constitutes merely a variety of the common L. squamatus. I recognised rightly L. nitidulus as the genuine Candollean plant already in 1854 (second general report, p. 12). Furthermore, I like here to mention that Helichrysum Gravesii, according to the late lamented Rev. W. W. Spicer, is indigenous to Clarke's Island and Kent's Group.

## REMARKS ON THE VEGETATION OF KING'S ISLAND,

By Baron Ferd. von Mueller, K.C.M.G.,M.D.,Ph.D.,F.R.S.

King's Island, situated about halfway between one of the most southern prominences of the Australian continent and the most north-western point of Tasmania, has remained, in reference to its vegetation, almost unknown; for although this island was discovered, and its shores were mapped fully 80 years ago, very few plants were ever collected there. Anxious to push on the phytologic investigation of Australia *anywhere, I recently* induced Mr. Edw. Spong, who held the position of Lighthouse-keeper at Cape Wickham, to form a collection of such plants as might be within his reach; and this endeavour to obtain a scientific insight into the vegetation there received every encouragement from A. E. Douglas, Esq., of the postal department of Hobart, so that now phytographic comparisons to some extent can be instituted between the island under consideration and the nearest regions of Tasmania and Victoria.

From a few plants of rarity previously obtained, such as Phyllocladus rhomboidalis, which does not extend to Victoria, and such as Elæocarpus cyaneus and Zoysia pungens, which are not known from Tasmania proper, it remained hitherto unascertained, to which of both phytographic regions the flora of the interjacent island more particularly belonged. The collections creditably formed last season by the young sons of Mr. Spong, are not sufficient to solve this question fully, inasmuch as many more species are likely to be found in localities of the island not readily accessible up to this time. Only two plants, absolutely new to the Tasmanian dominion, were discovered by Messrs. Spong, namely Podotheca angustifolia, and Dictyurus quercifolius; but, as in the instance of Nablonium calyceroides, the Podotheca may also yet be discovered in some of the north-western regions of Tasmania, which are hitherto still largely or even entirely devoid of settlements. While surveys are now proceeding in that direction, some botanic collections might also be formed with but little inconvenience, and certainly with no additional expenditure whatsoever. All such material from new regions tends to elucidate the physical features of any country, and aids in estimating its capabilities.

Although the collections, now got from King's Island, contain mainly plants of wide distribution as well in Tasmania as also in Victoria, it was deemed best to place all the collected species on record, and thus to give the first instalment of a floral enumeration pertaining to the island. The immigrated plants, already of not inconsiderable number, are omitted.

Clematis microphylla, Lepidium ruderale, L. foliosum, Cakile maritima, Papaver aculeatum, Boronia polygalifolia (var. pinnatifolia), Correa speciosa, Comesperma volubile, Dodonæa viscosa, Bursaria spinosa, Viola hederacea, Drosera peltata, Elæocarpus cyaneus, Geranium dissectum, Pelargonium australe, Urtica incisa, Beyera viscosa, Phyllanthus Gunnii, Sagina apetala, Muehlenbeckia apressa, Atriplex crystallinum, A. cinereum, Rhagodia Billardierii, Salicornia australis, Mesembrianthemum australe, M. æquilaterale, Tetragonia implexicoma, Stackhousia linarifolia, Tillæa verticillata, Acæna sanguisorbæ, Acacia longifolia *(var. Sophoræ)*, Dillwynia ericifolia, Swainsona lessertifolia, Calycothrix tetragona, Eucalyptus globulus, Leptospermum lævigatum, L. juniperinum, Melaleuca squarrosa, M. ericifolia, Pomaderris apetala, Epilobium tetragonum, Pimelea ligustrina, P. serpyllifolia, Banksia marginata, Daucus brachiatus, Apium prostratum, Sambucus Gaudichaudiana, Lagenophora Billardierii, Aster glutescens, A. stellulatus, A. lepidophyllus, A. axillaris, A. ramulosus, Nablonium calyceroides, Cotula filifolia, C. coronopifolia, Gnaphalium luteo-album, G. Japonicum, Helichrysum cinereum, H. apiculatum, Cassinia aculeata, C. spectablis, Calocephalus Brownii, Podotheca angustifolia, Erechtites quadridentata, Senecio spatulatus, S. lautus, S. odoratus, Wahlenbergia gracilis, Selliera radicans, Solanum aviculare (with its var. pygmala, flowering at a height of three inches), Myoporum insulare, Mentha gracilis, Ajuga australis, Alyxia buxifolia, Plantago varia, Styphelia Richei, S. ericoides, Sprengelia incarnata, Caladenia latifolia, Dianella longifolia, Potamogeton natans (var.), Cymodocea antarctica, Juncus communis, Restio tetraphyllus, Lepidosperma gladiatum, Scirpus nodosus, Sc. riparius, Carex pumila, C. paniculata, Danthonia penicillata, Poa cæspitosa, Distichlis maratima, Agrostis Solandri, Stipa flavescens, Dichelachne crinita, Pteris aquilina, Polypodium pustulatum, Fumaria hygrometrica, Cladonia reptipora, Ballia Brunonis, Cystophara platylobium, Melanthalia Billardierii, Dictyurus quercifolius, Phacelocarpus Billardierii.

I am not aware whether fern trees exist in King's Island; if so, then likely out of the ferns and their close allies—known to the number of fully 60 from Tasmania—many would accompany the arborescent kind, together with the so-called Pepper Tree, Sassafras, Musk Tree, Huon Pine, and a host of other plants, occurring only in springy and shady glades. It seems not even known yet whether any Casuarinas, the Wattle and Blackwood Acacias, the Oyster Bay Pine, and Xanthorrhœas extend to the island, nor have we learnt how many species of Eucalyptus occur there. The Mistletoes, advancing to the extreme South of Australia, may perhaps exist in King's Island. Of about 50 Tasmanian kinds of grasses, 60 of sedge-like plants, and 70 of orchids, many would likely be found in an insular area of half a hundred miles in length, containing doubtless great diversity of soil; further searches should therefore be instituted in various localities and throughout all seasons, especially during the spring, and the records on the Tasmanian flora would thus far also become gradually completed in reference to the outlying islands.

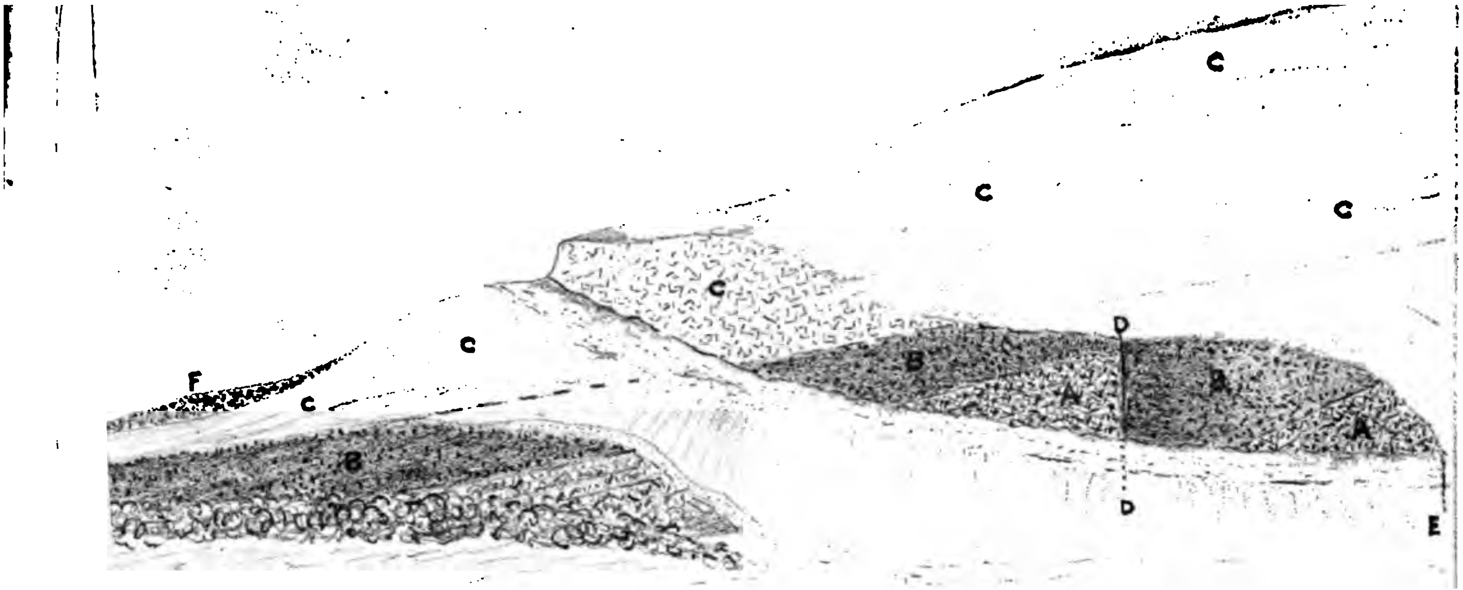
# DESCRIPTION OF A SPECIES OF SEA BREAM (*GIRELLA TRICUSPIDATA*), FROM SOUTHPORT, TASMANIA.

By R. M. Johnston, F.L.S.

[*Read* 15*th Nov.*, 1881.)

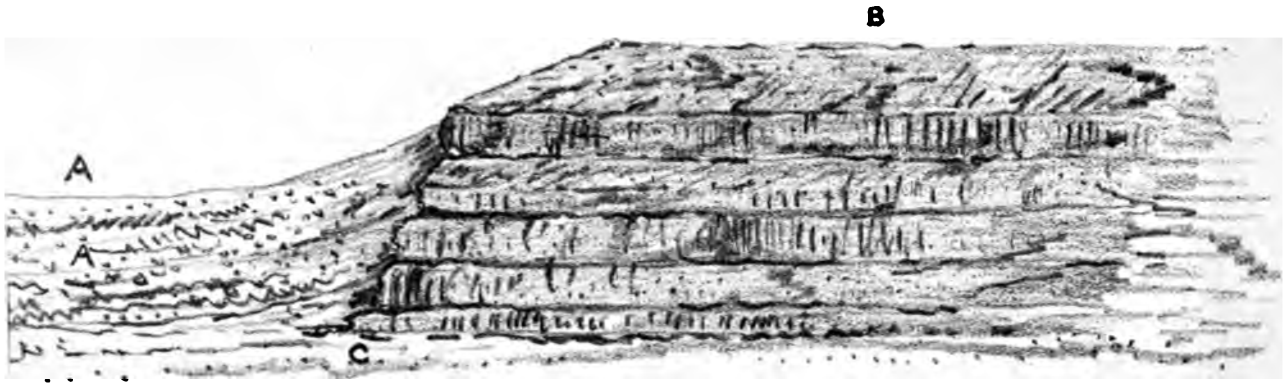
D $\frac{15}{13}$, A $\frac{3}{12}$, L. lat. 54-56, L. tr. $\frac{11}{23}$. The length of head is one fifth of the total length. Dorsal fin of moderate height, the spinous portion lower than the soft. The incisors three-pointed, moderately broad, imbricate, in several series in the upper and lower jaws. Colour uniform blackish-brown, with lighter tinge of olive towards belly and lower portion of head.

| | | |
|---|---|---|
| Total length ... ... ... ... | 15⅝ | inches. |
| Body ... ... ... ... ... ... | 13¼ | „ |
| Greatest depth ... ... ... | 5½ | „ |
| Depth of caudal peduncle ... | 1⅞ | „ |



arenaceous beds with included angular fossiliferous blocks of mudstone.
inated clays and sands full of leaf and fruit impressions.
ic basalt - from the cooling joints of which fossil bones were obtained.
oving up the beds. A.
Limit of exposed face.
with artificial accumulation of burnt comminuted shells of existing species associated with charred cinders of wood

FIG. 1 SECTION AT ONETREEPOINT.

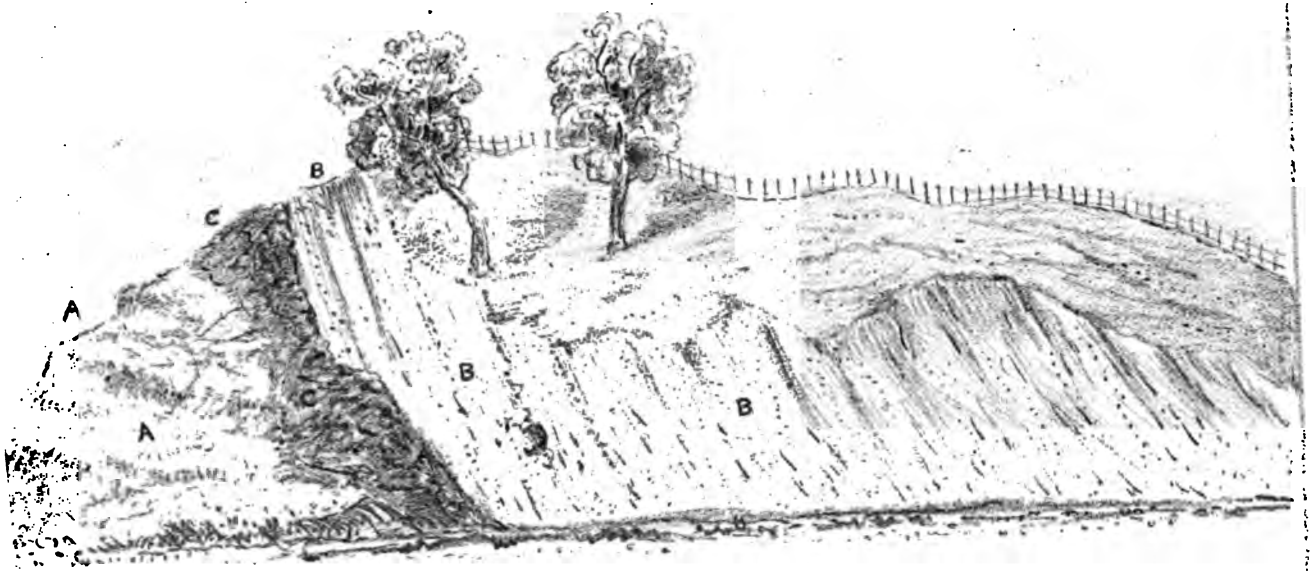


mivers of Tertiary lacustrine formation

Marine beds. Mudstone Series.

FIG 2. SECTION OPPOSITE SANDY BAY POINT.

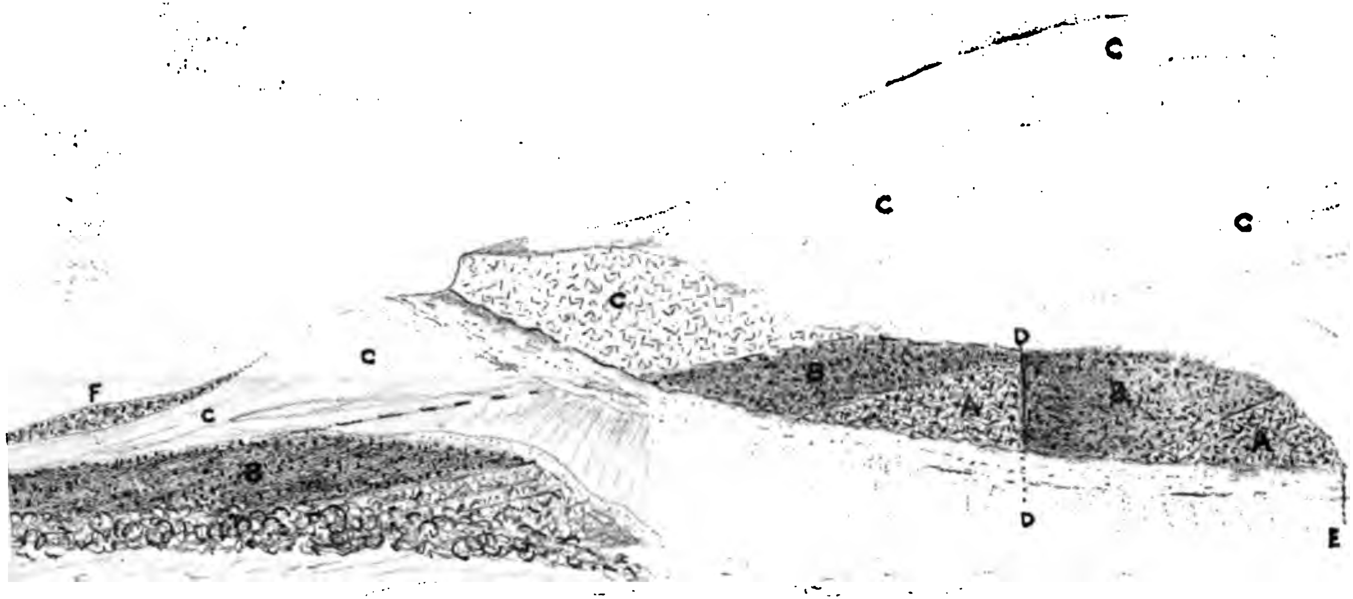
BROWN'S RIVER ROAD.



l sandstone of doubtful age.

rated clays blue and reddish more or less arenaceous · full of leaf and fruit impressions.

FIG. 3. SECTION NEARLY OPPOSITE NEW RIFLE RANGE. SANDY BAY.



arenaceous beds with included angular fossiliferous blocks of nu. size e .
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ering up the beds. A.
limit of exposed face.
with artificial accumulation of burnt comminuted shells of existing species associated with charred embers of wood

FIG. 1 SECTION AT ONETREEPOINT.

## EXPLANATION OF FIGURES.

| Figs. | 1 TO 68. |
|---|---|
| 1-33, 35. | Leaf impressions common to deposits at Geilston, Pipeclay Bluff, Cornelian Bay, Sandy Bay, and One Tree Point, principally taken, however, from One Tree Point and Pipeclay Bluff, Cornelian Bay. |
| 34. | Fruit impression finely, transversely, striated, from Pipeclay Bluff, Sandy Bay. |
| 36. | Impressions of curious jointed stem, frequently mistaken for the fossil impression of some form of **Pupa**; abundant Geilston Travertin. |
| 37. | Fossil impression of the imbricated foliage of Aracauria Johnstonii, F.v.M. A portion of the cone of do., 6. Portion of the same magnified. |
| 38-39. | Two views of a lignified fruit from the Deep Lead at Beaconsfield. |
| 40-41. | A species of Penteune (calcareous), probably *P. Allporti*, F.v.M., *n.s.*, for Geilston Travertin. Fig. 41 has been shown with six valves, by mistake, should be five nearly equal divisions. |
| 42-43. | A fossil fruit with four valves, allied to the genus Penteune, and found associated with 40 and 41. |
| 44-47. | Valves separated belonging to figs. 40-41. |
| 48-49. | Do., do., do., to figs. 42-43. |
| 50. | Fossil cast of *Plesiocapparis leptocelyphis.* Geilston and Pipeclay Bluff. |
| 51-52. | Fossil cast (calcareous) *Platycoila Sullivani*, F.v.M. Geilston. |
| 56-a.b.c. | Do., do. (lignite). Deep Lead, Beaconsfield. |
| 53. | Fossil cast of a fruit (calcareous) common in Travertin, Geilston. |
| 54-55. | Do., do., do., also common, do., do. |
| 57. | Fossil fruit (lignite) with curiously wrinkled surface, compressed, from Deep Lead, Beaconsfield. |
| 58. | Fossil cast (arenaceous) of fruit Stephenson's Bend, Launceston, and One Tree Point, Hobart. |
| 59-*a.b.* | *Concotheca turgida*, F.v.M., lignite. Beaconfield. |
| 60-*a.* | *Rhytidotheca Johnstonii*, F.v.M., *n.s.*, lignite. Deep Lead, Beaconsfield. |
| 61-62, *a.b.* | Compressed soft ligneous fruit, two sections from the lignites of Deep Lead, Beaconsfield. |
| 63-*a.b.* | Fossil incisor of an animal probably allied to the existing Halmaturus from the *bone breccia.* One Tree Point. |
| 64-a.b.c., *aa.*, *bb.*, *cc.* | Three sections actual magnified size of a tooth of a species of *Hypsipsyminus*, from the same point as 63. |
| 65. *a.b.c.d.* | Various sections of a leg bone of a marsupial, associated with 64. Nat. size. |
| 66-a.b.c. |  |
| 67-a.b.c. | Various bones. Nat. size. |
| 68-a.b. | Do., do. |

NOTE.—The various figures and sketches were kindly copied from the original drawings, and drawn upon lithographic transfer paper by my friend, Mr. Arthur Lovett.

R. M. J.

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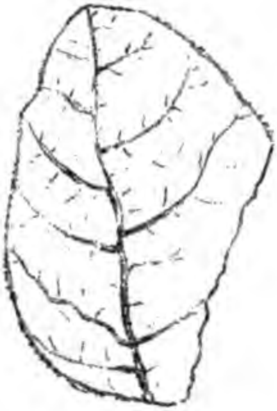

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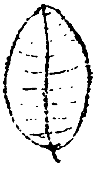

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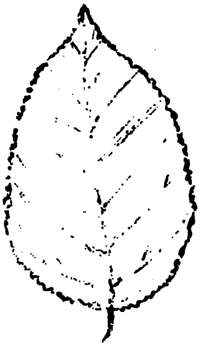

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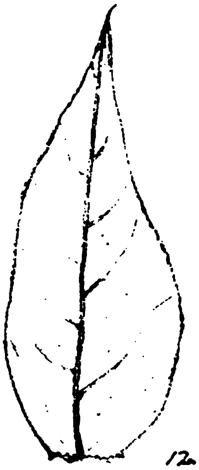

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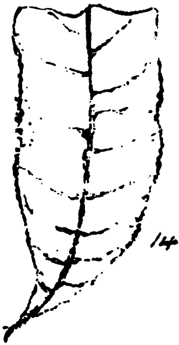

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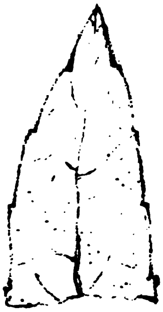

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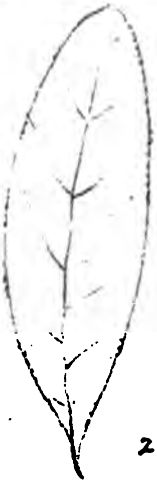

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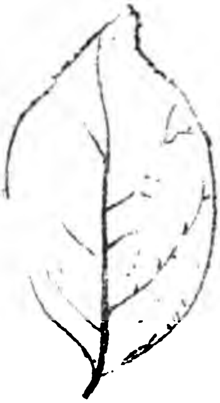

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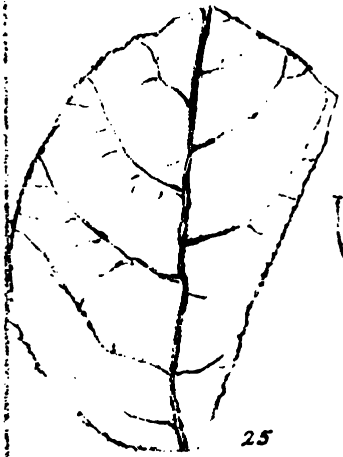

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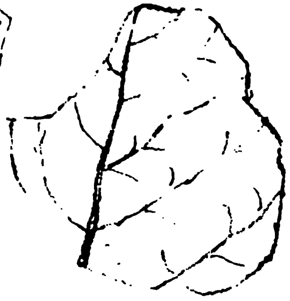

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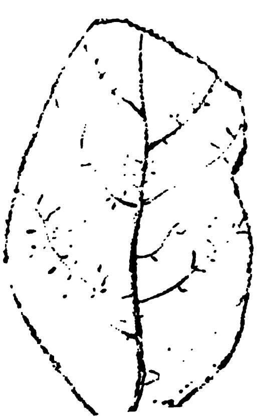

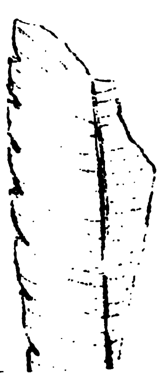

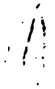

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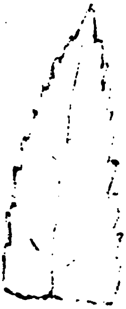

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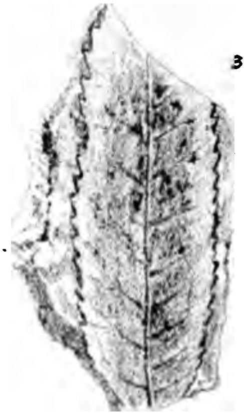

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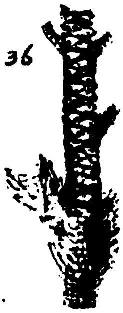

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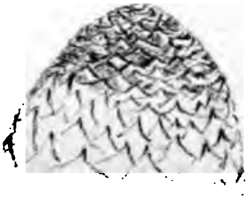
37 B.



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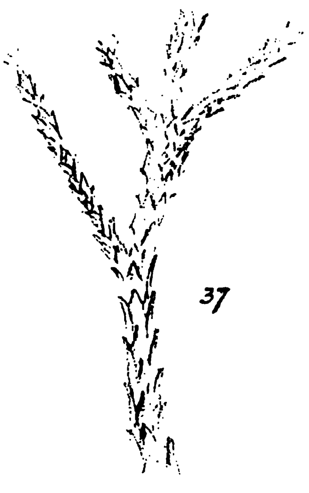

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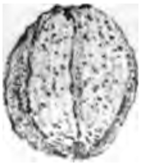

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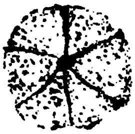

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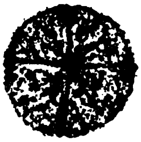

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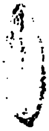

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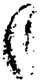

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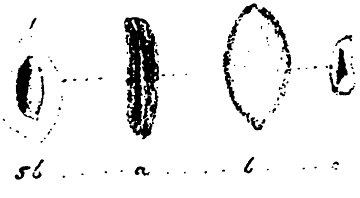
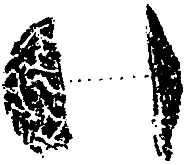


56 . . . . a . . . . b . . . c



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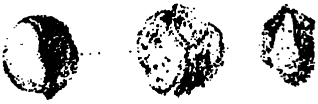

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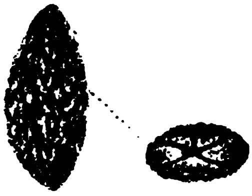

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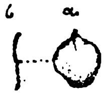

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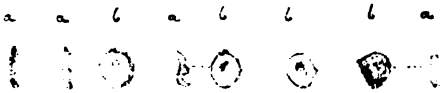

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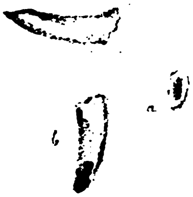

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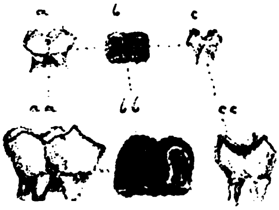

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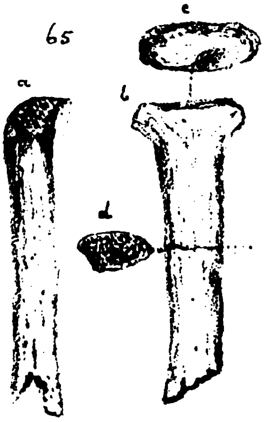

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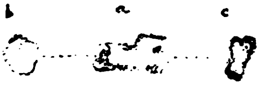

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# MONTHLY MEANS OF OBSERVATIONS TAKEN AT NEW NORFOLK, TASMANIA, 1881.

**Latitude 42° 46′ 48″ South.** **Longitude 147° 4′ 45″ East.**

| Months. | Barometer. | Thermometer. | | | | | Humidity of Air. | | | Condensation. | | Evaporation. | Ozone | Clouds. | Winds. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | At sea level Temperature 32°. | Mean Temperature of two Daily Registers | Mean Temperature of max. & min. in shade | Mean Diurnal Range | Mean Solar Intensity. | Mean Terrestrial Radiation. | Dew Point, Mean position. | Humidity of Air per 100. | Elastic Force of Vapor per 1000. | Rain in Inches. | No. of Days on which Rain fell. | Spontaneous Evaporation in Inches. | Mean Daily Amount, 2 registers. | Mean Daily Amount, 2 registers. | Prevailing Direction. | Force in lbs. per sq. inch. |
| | | ° | ° | ° | ° | ° | ° | | | | | | | | | |
| January…… | 29·960 | 63·48 | 64·25 | 26·16 | 136·06 | 43·06 | 50·05 | ·62 | ·360 | ·69 | 8 | 6·52 | 5·66 | 5·59 | SE.NW | |
| February…… | 30·051 | 61·61 | 62·64 | 27·96 | 134·53 | 40·00 | 49·63 | ·66 | ·356 | ·44 | 4 | 6·28 | 5·19 | 5·46 | SE.NW.W | |
| March…… | 30·041 | 60·27 | 61·35 | 21·93 | 123·64 | 42·63 | 50·40 | ·70 | ·366 | 1·85 | 10 | 4·01 | 6·48 | 6·90 | NW.SE | |
| April…… | 30·131 | 52·02 | 53·65 | 20·80 | 116·06 | 35·00 | 45·88 | ·80 | ·307 | 1·33 | 10 | 2·04 | 6·10 | 6·03 | NW.SE.W | |
| May…… | 30·186 | 48·04 | 49·06 | 17·33 | 105·40 | 31·93 | 43·78 | ·86 | ·283 | 3·20 | 17 | 1·82 | 6·33 | 6·76 | NW | |
| June…… | 29·946 | 41·34 | 43·05 | 15·03 | 90·50 | 29·16 | 38·40 | ·90 | ·231 | 1·57 | 9 | ·82 | 6·81 | 6·25 | W | |
| July…… | 30·088 | 44·06 | 44·75 | 19·30 | 106·46 | 27·33 | 42·58 | ·94 | ·268 | 1·25 | 14 | 1·14 | 6·81 | 5·74 | W.SW | |
| August…… | 30·030 | 45·83 | 47·70 | 19·09 | 111·51 | 30·77 | 39·40 | ·79 | ·243 | 1·75 | 14 | 2·38 | 6·93 | 6·95 | NW.W.SW | |
| September…… | 29·932 | 48·00 | 49·34 | 23·96 | 120·27 | 29·86 | 39·61 | ·73 | ·243 | 1·41 | 14 | 3·08 | 6·59 | 5·68 | NW.SW | |
| October…… | 30·049 | 54·33 | 54·32 | 24·48 | 121·03 | 35·00 | 44·46 | ·69 | ·292 | 1·36 | 11 | 4·02 | 6·24 | 6·22 | NW.SE.W | |
| November…… | 29·879 | 60·20 | 59·93 | 23·10 | 129·43 | 41·00 | 48·97 | ·66 | ·346 | 2·98 | 13 | 4·95 | 6·55 | 6·01 | SE.SW | |
| December…… | 29·793 | 60·91 | 60·87 | 24·25 | 132·03 | 40·67 | 46·91 | ·62 | ·323 | 1·57 | 12 | 5·28 | 6·19 | 5·80 | NW.SE | |
| Sums…… | 360·086 | 640·09 | 650·91 | 263·39 | 1426·92 | 420·41 | 540·16 | 8·97 | 3·618 | 19·40 | 136 | 42·34 | 75·88 | 73·39 | NW.W.SE | |
| Mean for 1881. | 30·007 | 53·34 | 54·24 | 21·94 | 118·91 | 35·53 | 45·01 | ·74 | ·301 | 1·61 | 11·33 | 3·52 | 6·32 | 6·11 | | |
| Mean for 1880. | 29·962 | 53·37 | 54·26 | 21·10 | 118·56 | 37·36 | 44·95 | ·74 | ·305 | 1·93 | 12 | 3·65 | 5·19 | 5·92 | W.NW.SE | |
| Mean for 1879. | 30·013 | 53·14 | 53·06 | 22·24 | 120·12 | 35·37 | 44·64 | ·75 | ·294 | 1·58 | 11·25 | 2·79 | 5·93 | 5·55 | NW.W | |
| Mean for 1878. | 29·927 | 52·87 | 53·64 | 20·93 | 116·88 | 36·48 | 44·52 | ·74 | ·282 | 2·32 | 12·50 | 4·01 | 7·26 | 5·90 | W.SE | |
| Mean for 1877. | 30·005 | 52·71 | 52·98 | 22·03 | 118·35 | 36·02 | 44·37 | ·75 | ·297 | 1·88 | 11·66 | 4·28 | 7·91 | 5·71 | W.SE | |
| Mean for 1876. | 29·887 | 52·92 | 54·18 | 21·61 | 116·37 | 37·12 | 45·22 | ·76 | ·308 | 1·96 | 11·41 | 4·10 | 6·81 | 5·49 | W | |
| Mean for 1875. | 29·863 | 54·62 | 53·65 | 21·33 | 116·84 | 37·69 | 45·99 | ·75 | ·320 | 2·34 | 14·41 | 4·03 | 7·31 | 5·56 | W.SE | |

**Total Rainfall for 1880, 23·19in.; for 1879, 19·01in.; for 1878, 27·83in.; for 1877, 22·63in.; for 1876, 23·54in.; for 1875, 28·17in.; for 1874, 23·04in.**

W. E. SHOOBRIDGE

# REPORT

OF THE

# ROYAL SOCIETY

OF

# TASMANIA

FOR THE YEAR

1881.

Tasmania:
WILLIAM THOMAS STRUTT, GOVERNMENT PRINTER, HOBART.

1882.

# ROYAL SOCIETY OF TASMANIA.

**Patron:**
HER MAJESTY THE QUEEN.

**President:**
HIS EXCELLENCY MAJOR SIR GEORGE CUMINE STRAHAN, R.A., K.C.M.G.

**Vice-Presidents:**
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JAMES BARNARD, ESQ.
HIS HONOR MR. JUSTICE DOBSON.
THOMAS STEPHENS, ESQ., M.A., F.G.S.

**Council:**
*THE RIGHT REV. BISHOP BROMBY, D.D.
*JOHN SWAN, ESQ.
*JUSTIN M'C. BROWNE, ESQ.
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T. STEPHENS, ESQ., M.A., F.G.S.
H. J. BUCKLAND, ESQ.
J. BARNARD, ESQ.
HIS HONOR MR. JUSTICE DOBSON.
C. H. GRANT, ESQ.
RUSSELL YOUNG, ESQ.
HON. J. W. AGNEW, M.D.

**Treasurer:**
C. J. BARCLAY, ESQ.

**Hon. Secretary:**
JAMES BARNARD, ESQ.

**Auditors of Annual Accounts:**
F. BUTLER, ESQ.
JOHN MACFARLANE, ESQ.

**Auditors of Monthly Accounts:**
H. J. BUCKLAND, ESQ.
C. T. BELSTEAD, ESQ.

**Curator of Museum:**
MR. T. ROBLIN.

**Superintendent of Gardens:**
MR. F. ABBOTT, JUN.

* Members who retire next in rotation.

## Honorary Member:

Mrs. Meredith, Launceston.

## Corresponding Members:

*** Members who have contributed Papers which have been published in the Society's Transactions.**

W. H. Archer, Esq., Sydney, New South Wales.

Sir Joseph Dalton Hooker, C.B., K.C.S.I., &c., &c., London.

*Baron F. Von Müeller K.C.M.G., M.D., F.R.S., F.L.S., &c., Government Botanist, Melbourne, Victoria.

C. Tomlinson, Esq., F.R.S., F.C.S., &c., Highgate, near London.

*G. Bennett, Esq., M.D., F.Z.S., Sydney, New South Wales.

Professor G. Neumayer, Munich.

*Rev. J. E. Tenison-Woods, F.L.S., F.G.S., F.R.G.S.

Dr. W. O. Sonder, Foreign Hon. Sec. Society of Naturalists, Hamburg.

Rev. J. J. Bleasdale, D.D., F.G.S.

*Captain W. V. Legge, R.A., F.Z.S., M.R.A.S., England.

Professor John Agardh, M.D., University of Lund, Sweden.

Dr. Julius Haast, F.R.S., Director of Museum, Christchurch, New Zealand.

Archibald Liversidge, Esq., F.G.S., Professor of Geology and Mineralogy in the Sydney University.

Professor W. Harkness, U.S.N., United States Naval Observatory, Washington.

Henry Haylin Hayter, Esq., Government Statist, Melbourne.

*Frederick M. Bailey, Esq., Brisbane, Queensland.

*Ralph Tate, Esq., Assoc. Lin. Soc., F.G.S., Professor of Natural History, University of Adelaide.

*John Brazier, Esq., C.M.Z.S., Sydney.

*Richard Schomburg, Ph.D., C.M.Z.S., Director of Botanic Gardens, Adelaide.

Professor G. F. H. Ulrich, F.G.S., Melbourne.

Alexander Wallace, Esq., Secretary Board of Agriculture, Victoria.

*F. W. Hutton, Esq., F.G.S., C.M.Z.S., Professor of Biology, Canterbury College, Christchurch, New Zealand.

Rev. George Brown, C.M.Z.S., Sydney.

Professor F. M'Coy, F.G.S., University, Melbourne.

R. J. L. Ellery, Esq., F.R.S., F.R.A.S., Government Astronomer, Melbourne.

Mons. J. N. Verschaffelt, Ghent, Belgium.
Robert Etheridge, jun., F.G.S., British Museum.
James Hector, M.D., C.M.G., F.R.S., F.G.S., Director Geological Survey of New Zealand, Wellington.
Rev. Charles Rogers, LL.D., Secretary Royal Historical Society, London.
E. P. Ramsay, F.L.S., Curator of Australian Museum, Sydney.
Hon. W. M'Leay, F.L.S., Sydney.
William Tompson Bednall, Adelaide, South Australia.

## List of Fellows and Members.

* Fellows who have contributed Papers which have been published in the Society's Transactions. † Denotes Life Membership.

*Abbott, Francis, F.R.S., F.R.M.S., Hobart.
*Abbott, F., jun., ditto.
Adams, G. P., ditto.
*Agnew, Hon. J. W., M.D., M.L.C., Fellow of the Linnean Society of New South Wales, ditto.
Aikenhead, Hon. J., M.L.C., Launceston.
Adams, R. P., Solicitor-General, Hobart.
Aubin, Mrs. F., ditto.
Allport, Morton John Cecil, ditto.
Atkins, Charles J., ditto.

Bilton, H., Glenorchy.
*Barnard, James, Hobart.
Butler, Francis, ditto.
*Bromby, Right Rev. C. H., D.D., Lord Bishop of Tasmania, Hobart.
Bright, R.S., M.R.C.S., Eng., ditto.
Butler, Henry, F.R.C.S., Eng., ditto
Buckland, H. J., ditto.
Browne, Justin M‘C., ditto.
Barclay, C. J., ditto.
Bedford, W., Anstey Barton.
Belstead, C. T., Hobart.
Belbin, W., M.H.A., ditto.
Benjafield, H., M.B., ditto.
Brown, Hon. N. J., M.H.A., Meadow Banks, Glenora.
Bidencope, J., Hobart.
Butler, E. H., ditto.
Bailey, Rev. J. H. Brooke, ditto.
Barnard, C. E., M.D., New South Wales.
Brock, H. J., Campania.
Beddome, C. E., Hillgrove, Brown's River Road.
Burgess, W. H., Hobart.
Bethune, John C., Dunrobin.
Barnes, William, Trevallyn, Launceston.

Chapman, Hon. T. D., M.L.C., New Town.
Cook, Henry, Hobart.
Clark, J. M., ditto.
Creswell, C. F., ditto.
*Cotton, Francis, Swanport.
Crawford, Lieut.-Colonel, Hamilton-on-Forth.

Clarke, J. K., New South Wales.
Cruttenden, Thomas, Woodsden, Buckland.
Coote, Audley, Sandy Bay.
Cowle, Miss, Hobart.
Crowther, A. B., M.R.C.S., Eng., ditto.
Crosby, R., ditto.
Crowther, E. L., M.D., ditto.
Crouch, E. J., M.R.C.S., Eng., ditto.
Crosby, William, jun., ditto.

*Dobson, His Honor Mr. Justice, ditto.
Dobson, H., ditto.
Dowdell, C., ditto.
Davies, R. L., ditto.
Dodds, the Hon. J. S., M.H.A., ditto.
Dobson, Hon. Alfred, M.H.A., ditto.

Elliston, C. H., ditto.
Evans, T. M., ditto.

Fysh, Hon. P. O., ditto.
Freeman, E. J., ditto

†Gellibrand, Hon. W. A. B., M.L.C., Hon. Member Leeds Institute, River Ouse.
Grant, C. H., Hobart.
Gray, Rev. John, Glenorchy.
Grahame, W. H., Hobart.
Giblin, Edward O., M.D., ditto.
Grant, James, ditto.
Gawne, E. B., Bellerive.

*Hall, E. Swarbreck, M.R.C.S., Eng., Hobart.
Harris, Rev. R. D. P., ditto.
Hunter, Henry, ditto.
Huybers, A., ditto.
Howell, F. G., ditto.
Holden, L. A., M.R.C.S., Eng., ditto.
Hookey, Vernon W., ditto.
Henry, Robert, junr., ditto.
Hamilton, Jno., Hobart.
Hull, H. M., ditto.

*Johnston, R. M., ditto.

Kennerley, Hon. Alfred, ditto.

Kermode, W. A., Mona Vale.

Lewis, Hon. David, M.H.A., Hobart.
Lucas, R. J., ditto.
Latham, G. H., ditto.
Lovett, W., Colonial Auditor, ditto.

Maclanachan, Hon. James, Ballochmyle.
Macfarlane, James, Hobart.
Macfarlane, John, ditto.
Mather, J. B., ditto.
Maxwell, C. M., ditto.
*†Milligan, Joseph, F.L.S., England.
Marsh, H. J., ditto.
†Mace, G., Spring Bay.
Morris, W. V., Hobart.
Murphy, Most Rev. D., Bishop of Hobart.
Macmichael, John C., Hobart.
Maddox, Wm. Gordon, M.R.C.S., Eng., Launceston.
Mason, Wm., M.R.C.S., Eng., ditto.
Mace, F., Buckland.
Macfarlane, W. H., M.B., New Norfolk.

Napier, G. R., Hobart.
*Nowell, E. C., ditto.
Nairn, C. C., New Town.
Nicholas, Wm., Nant, Bothwell.
Nicholas, Geo. C., Mill Brook, Ouse.

Pillinger, J., Antill Ponds.
Perkins, H. A., M.D., M.R.C.S., Eng., Hobart.
Parsons, Cecil J., New Town.
Petterd, W. F., C.M.Z.S., Launceston.

Roberts, H. L., Hobart.
Read, R. Cartwright, Redlands, New Norfolk.
Riddoch, A., M.H.A., New Norfolk.
Roblin, T., Curator of Museum, Hobart.
Reynolds, W. J. J., ditto.
Richards, Rev. George B., President of Horton College, Ross.

Seal, M., Hobart.
Smith, His Honor Sir Francis, Chief Justice, ditto.
†Solomon, Joseph, Hobart.
*Stephens, T., M.A., F.G.S., Inspector of Schools, ditto.

Story, Dr. G. F., Swanport.
Salier, F. J., Hobart.
*Swan, John, ditto.
*Shoobridge, W. E., New Norfolk.
Shoobridge, E., ditto.
*Simson, A., Launceston.
Scott, Hopton, Hobart.
Swan, E. D., ditto.
Sharp, J., ditto.
Shoobridge, R. W. G., New Norfolk.
Smith, C. H., Launcesson.
Stone, T., Hobart.
Stanley, Captain, R.N., Hobart.
Shaw, Bernard, Launceston.
Simmons, Rev. J. Wilkes, Hobart.

*Travers, S. Smith, New Town.

Walch, James H. B., Hobart.
Weaver, W. G., ditto.
Whyte, Hon. James, ditto.
Wilson, George, Mount Seymour.
Wise, F. H., Hobart.
Webster, A. G., ditto.
Wright, Stephen P. H., Glenorchy.
Westbrook, G. C., Hobart.
Woodgate, E. W., Launceston.
Walker, James Backhouse, Hobart.
Wagenknecht, Albert, George's Bay.
Wintle, S. H., F.L.S., ditto.

Young, Russell, Hobart.

## Obituary.

Gould, John, F.R.S., F.L.S., F.Z.S., the eminent Ornithologist.—For many years a Corresponding Member of the Society. Died in London, 3rd February.

Whitcomb, George.—Elected a Fellow of the Society in 1851. Died 19th February.

Gunn, Ronald Campbell, F.R.S., F.L.S.—One of the founders of the Society. Died at Launceston, 23rd March.

Hall, Edward Swarbreck, M.R.C.S., Eng.—A Fellow of the Society since 1854. Died at Hobart, 30th July.

## *MINUTES of the Annual General Meeting of the* ROYAL SOCIETY OF TASMANIA, *held at the Museum, Macquarie-street, at half-past Seven* P.M. *on Thursday, 26th January,* 1882; JUSTIN M'CARTY BROWNE, *Esq., in the Chair.*

THE advertisement by which the meeting had been convened having been read, the Chairman called upon the Secretary to read the Annual Report.

The Report for 1881 was then read.

Mr. C. H. Grant, in moving the adoption of the Report, and that it be printed and distributed among the Fellows, said that it was a very satisfactory statement, especially so far as it related to financial affairs. They had commenced the year with a debit balance, and had concluded with money to their credit, which, although not of a great amount, was yet very satisfactory, showing that their worthy Secretary had carefully managed the finances of the Society. The work during the past year, although showing no great results, still made evident the fact that the Society had laboured successfully. Visitors to the Gardens during the year had been much delighted with them; and many of those from the neighbouring Colonies, and even from England, had spoken highly of the grounds, and of the orderly state in which they were kept. In the Library there had been a steady increase to the number of its volumes. It also had received eulogy from visitors, being undoubtedly, as a scientific Library, one of the best in the Colonies. He hoped that in the future the work of the Society would progress as satisfactorily as it had done in the past.

Mr. R. Henry seconded the motion, which was then put and carried.

The Hon. Secretary, Mr. Barnard, reported that the retiring Members of Council were Mr. Justice Dobson, Dr. Agnew, Messrs. C. H. Grant and Russell Young; that these names had been posted in the Library, agreeably to Rule 32; and that no other nominations had been received.

It was resolved that the retiring Members of Council be re-elected.

Messrs. F. Butler and John Macfarlane were again elected Auditors of Annual Accounts.

Mr. Wm. Nicholas, Nant, Bothwell, and Mr. Geo. Clarence Nicholas, Millbrook, Ouse, were elected Fellows of the Society.

Dr. Perkins moved a vote of thanks to Mr. Barnard, their worthy Secretary. He was sure he had given a great deal of time to the work of the Society. He had been most indefatigable in endeavouring to follow closely the footsteps of Dr. Agnew, who had left the Society as a foster child in his hands.

Mr. Stephens seconded the motion. It was fortunate for the Society that it had a gentleman with some measure of spare time on his hands, and willing, as was not in all cases the rule, to devote that time to a Society such as theirs. He thought he expressed the sentiments of all when he said they were grateful to Mr. Barnard for his assistance to the Society in the capacity of Hon. Secretary.

The motion was then put, and carried unanimously.

Mr. Barnard, in acknowledging the vote, said that he was but too happy to aid the Society, and found the employment given to him most congenial. It had been fortunate that when last year he retired from the office which he had held for many years, he had found an opportunity to thus occupy his leisure time. It had been his desire, wish, and hope that the office of Hon. Secretary should suffer no discredit whilst in his hands. He had endeavoured to promote the objects of the Society in every way possible, and he thanked them for the support he had met with in his efforts. All would welcome the return of Dr. Agnew; and he hoped that when he came back he (Mr. Barnard) would be able to hand over the office of Secretary to him without it having suffered any detriment. He desired to acknowledge the assistance he had received from the co-operation of the Curator, Mr. Roblin, whose services were of a most valuable nature to the institution, and worthy of far higher pecuniary recognition than they received. The Society and public were much indebted to that gentleman; and he felt that he could not say too much regarding the services Mr. Roblin had rendered the Society. Although Curator of the Museum, his labours were not confined to that branch of the Society; and he (Mr. Barnard) hoped that some means would be devised for making the office a more remunerative one than at present.

A vote of thanks to the Chairman concluded the business.

# REPORT.

The session of 1881 was opened on April 12, with an inaugural address by His Excellency Sir J. H. Lefroy, K.C.M.G., C.B., F.R.S., as President of the Society. This was followed by a paper read by Mr. R. M. Johnston, F.L.S., entitled "Notes showing that the estuary of the Derwent was occupied by a Freshwater Lake during the Tertiary period." The following papers were brought forward at the various subsequent meetings:—"Notes on two new Marine Shells (*Delphinula Johnstoni* and *Leda Lefroyi*)," dredged off Three Hut Point, D'Entrecasteaux Channel, by Lieut. C. E. Beddome, I.N.—"Suggestions for an extended elucidation of the Plants of Tasmania," by Baron F. Von Müeller, K.C.M.G, M.D., F.R.S.—"Notes on a species of Eucalyptus (*E. hæmastoma*)," not hitherto recorded in the Flora of Tasmania, by T. Stephens, Esq., M.A., F.G.S.—"On Auriferous Country and Gold-bearing Rocks," by Charles E. Barnard, M.D., F.L.S.—"On Type Species of Tasmanian Shells unrecorded in 'Census of Tasmanian Shells,'" by Professor R. Tate, Assoc. Linn. Soc. F.G.S.—"Notes on a species of *Zieria* (*Z. veronica*)," by Augustus Simson, F.L.S.—"On the Queen's Domain, Hobart, with suggestions for its improvement," by E. J. Crouch, M.R.C.S., Eng.—"Remarks on the Abstracts of the Meteorological Observations taken at the Lighthouses and other Coast Stations in Tasmania during the years 1871, 1872, 1873, 1874, and 1875," by E. C. Nowell, Government Statistician.—"On the question of establishing a 'Botanical Class-Ground' in the Society's Gardens," by T. Stephens, M.A., F.G.S.—"On the Magnetic Variation at Hobart, and its change in amount since last determined," by His Excellency Sir J. H. Lefroy, K.C.M.G., C.B, F.R.S., President of the Society.—"On the Scamander Gold Field," by S. H. Wintle, F.L.S.—"Notes on *Leontopodium catipes*," by Baron F. Von Müeller, K.C.M.G., M.D., F.R.S.

The Council have to record the loss sustained during the year by the death of Mr. Ronald Campbell Gunn, F.R.S., F.L.S., a distinguished botanist and man of science, and who had been associated with the earliest history of the Society; and also of Mr. John Gould, F.R.S., the eminent ornithologist, whose publications are of world-wide celebrity. One of the original Members of the Society, the late William Henty, deserves mention from his uniform support to the interests of horticulture and botany during his lengthened residence in Tasmania. The list would be incomplete without a reference to Dr. E. S. Hall, whose labours in the cause of sanitary science in conjunction with meteorology and vital statistics were so well known and highly appreciated both at home and abroad. Seventeen new Members were elected into the Society during the year, and there was but one resignation.

Meteorological Returns have, as usual, been received from the various Lighthouses, through the Marine Board; and Mr. W. E. Shoobridge has furnished the results of his observations taken at New Norfolk during the past year. An Abstract for the five years ending in 1880, of the Lighthouse Tables, is in the press. No observations have, as yet, been resumed at Hobart, but steps are in progress to effect this desirable object early in 1882. In connection with this subject, the Council has to acknowledge the presentation to the Society by the late President, Sir J. H. Lefroy, of ten Rain Gauges, for the purpose of instituting a systematic enquiry into the local distribution of rain in Tasmania,—an act of thoughtful kindness and liberality which well deserves acknowledgment.

The movement, initiated at an evening meeting of the Society, for the improvement of the Queen's Domain, has received the sanction of the Government, who have placed a sum of money at the disposal of the Committee which has been formed for the purpose of carrying out the work.

## COUNCIL.

A vacancy in the Council has occurred during the year, occasioned by the retirement of Mr. Francis Abbott, F.R.A.S., which has been filled up by the re-election of the Right Rev. Bishop Bromby. The list of retiring

Members has been posted in the Library for the last three days, agreeably to Rule 33.

## FINANCE.

The income from all sources was as follows:—Government grant in aid to Museum, £200; ditto to Gardens, £600; annual subscriptions, £166; special donation from Sir J. H. Lefroy, £5; from Marine Board, £20; sale of plants, &c. at Gardens, £70 4*s.* 10*d.*, giving a total of £1061 4*s.* 10*d.* The expenditure amounted to £1046 4*s.* 4*d.*, thus leaving a balance to credit in the Commercial Bank of £15 0*s.* 6*d.* The outstanding liabilities will probably amount to not more than £20, against which must be placed £30 12*s.* in the hands of Mr. Abbott for weekly payment of wages at Gardens, and arrears of subscriptions estimated at £20.

## GARDENS.

About 300 new plants have been added to the collection, many of which, when fully developed, will doubtless prove of an ornamental character. From Mons. J. Linden, of Ghent, was received a collection of Camellias and Azaleas, packed in an ordinary case, and sent in the hold of one of the Orient steamers. The plants arrived in excellent condition, the Camellias especially, not having lost a leaf. The experiment will prove of interest to persons introducing plants of this description. It may be worthy of note that the American Cranberry (*Vaccinium macrocarpon*), introduced into the Gardens a few years ago, has increased sufficiently to fill a large tub, and is apparently thriving. This plant is valuable for cultivation on wet peat bogs, but suitable for little else. In Canada and the United States it is subjected to regular culture, and is a source of great profit. About ten thousand Norfolk Island Pines have been raised from seed received from Norfolk Island. This is worthy of record, as being the first batch raised from seed in the Colony. The plants will be valuable for effecting exchanges. In the propagating yards various alterations, necessitated by the decay of the old fencing, and additions have been made. A rough fern house has been erected, and also a large trellis work shelter for pot plants. Progress is being made with the new plant labels. About 1000 have been prepared, and several hundreds of the names printed ready for mounting. This work will be pushed on as expeditiously as possible. Thanks are due to the Directors of the Royal Gardens, Kew, London; the Botanic Gardens, Adelaide and Melbourne; Baron Von. Müeller; the Chamber of Agriculture, Washington, U.S.A.; Messrs. Low of London; Verschaffelt, and Linden, of Ghent, Belgium, and others, for their valuable donations and exchanges during the year; also to the owners and captains of vessels, who have on many occasions gratuitously carried cases of plants, &c. for the Gardens. The Government has rendered its usual assistance, as far as was in its power, in the supply of labour necessary for the performance of the rougher garden operations. The approximate number of visitors to the Gardens during the year was 51,914.

## MUSEUM.

As stated in the monthly reports of the meetings, many objects of interest have been added to the collection during the year. As deserving special notice may be mentioned a large number of mineral specimens received, through the Tasmanian Commissioners for the Melbourne Exhibition, from the Sandhurst School of Mines; a collection of named casts of fossils, &c. presented by Professor Ward, of Rochester, United States; a collection of bird skins from Singapore, the gift of His Excellency Sir F. A. Weld, K.C.M.G.; a collection of British birds' eggs, from Mr. W. R. Stephens; 2 carved masks, worn by the natives of New Ireland in their dances, from the Rev. George Brown; a specimen of that peculiar fish, the *Ceratodus Forsteri*, from the Burnett River, Queensland, from Mr. R. B. Sheridan, &c. The task of re-naming and cataloguing the collection of birds, comprising several hundred specimens, has been undertaken by Mr. E. D. Swan, who has made considerable progress with the work. The mounted specimens, also, are being thoroughly cleaned and re-arranged under Mr. Swan's supervision; and the best thanks of the Society are due to that gentleman for his unremitting attention to this important matter. A few specimens have been added to the conchological collection. Mr. Legrand has, as usual, attended to this part of the Museum, and has rendered assistance in various other ways during the year. The very limited amount of assistance available for Museum purposes renders it impossible to make much progress with the collection,—the services of a skilled Taxidermist and Articulator, for whom ample employment could be found, being greatly needed. Additional table cases are required for minerals and fossils; also book cases, or shelving, for the Library. The attendance of visitors to the Museum keeps up well, as will be seen by the following figures; viz.—On week-days, 9685; on Sundays, 5884,—making a total for the year of 15,569. It is only between the hours of half-past 2 and 5 in the afternoon of Sunday that the Museum is opened; and this arrangement, as will be seen by the number availing themselves of the opportunity, may be pronounced to be no longer an experiment, and to be fully justified by the quiet and orderly demeanour of the visitors.

## STATEMENT *of the Funds of the* ROYAL SOCIETY OF TASMANIA *for the Year* 1881.

| **Receipts.** | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Annual Subscriptions from 79 Members | 118 | 10 | 0 | | | |
| Ditto, arrears from former years.. | 47 | 10 | 0 | | | |
| Special donation from His Excellency Sir J. H. Lefroy ................ | 5 | 0 | 0 | | | |
| From Marine Board for clerical assistance in completing the Light-house Meteorological Tables ............ | 20 | 0 | 0 | | | |
| *Total Royal Society*........ | .. | | | 191 | 0 | 0 |
| *Museum.* | | | | | | |
| Grant in aid from Treasury........ | ... | | | 200 | 0 | 0 |
| *Botanic Gardens.* | | | | | | |
| Grant in aid from Treasury........ | 600 | 0 | 0 | | | |
| Proceeds of sale of Plants, Fruit, Flowers, &c. .................. | 70 | 4 | 10 | | | |
| | | | | 670 | 4 | 10 |

| **Expenditure.** | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Jan. 13—Balance overdrawn at Commercial Bank, as per statement for 1880.......................... | .. | | | 63 | 6 | 7 |
| June 30—Interest on overdrawn account | .. | | | 1 | 4 | 4 |
| *Royal Society.* | | | | | | |
| Meteorological Instruments........ | 2 | 4 | 9 | | | |
| Printing and Advertising.......... | 26 | 13 | 6 | | | |
| Postage, Parcels, &c. ............ | 3 | 4 | 9 | | | |
| Collector's Commission .......... | 4 | 1 | 6 | | | |
| Messenger ...................... | 0 | 5 | 0 | | | |
| Sundries ...................... | 1 | 5 | 6 | | | |
| Clerical assistance for Meteorological Tables ...................... | 20 | 0 | 0 | | | |
| Library Books, Stationery, Binding, &c. ....................... | 46 | 4 | 3 | | | |
| *Total Royal Society*........ | .. | | | 103 | 19 | 3 |
| *Museum.* | | | | | | |
| Salary of Curator ................ | 125 | 0 | 0 | | | |
| Wages of Attendant .............. | 52 | 0 | 0 | | | |
| Ditto, for Sunday duty .......... | 13 | 0 | 0 | | | |
| Insurance ...................... | 4 | 15 | 8 | | | |
| Purchase & preparation of Specimens, &c. ....................... | 9 | 13 | 0 | | | |
| Water Rate...................... | 5 | 13 | 4 | | | |
| Sweeping Chimneys .............. | 0 | 10 | 6 | | | |
| Fuel and Light .................. | 3 | 16 | 0 | | | |
| Sundries and Petty Cash .......... | 2 | 7 | 2 | | | |
| Ironmongery, Brushware, &c....... | 4 | 19 | 5 | | | |
| Freight and carriage of Specimens.. | 1 | 15 | 6 | | | |
| Fittings, Repairs, &c. ............ | 8 | 17 | 0 | | | |
| *Total Museum* ............... | .. | | | 232 | 7 | 7 |

| | £ | s. | d. |
|---|---|---|---|
| | £1061 | 4 | 10 |

Nota.

*Dr.*

| | | £ | s. | d. |
|---|---|---|---|---|
| To outstanding accounts, Printing, Binding, &c., estimated at .............. | .. | 20 | 0 | 0 |

*Cr.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| By cash in hands of Mr. Abbott for weekly payment of Wages at Gardens ...... | 30 | 12 | 0 | | | |
| Balance at Bank .................... | 15 | 0 | 6 | | | |
| | | | | 45 | 12 | 6 |
| Balance to Credit............ | .. | | | £25 | 12 | 6 |

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Stationery and Stamps............ | 3 | 19 | 2 | | | |
| Forage.......................... | 7 | 3 | 2 | | | |
| Horse Hire.................... | 5 | 12 | 0 | | | |
| Ironmongery, Brushware, &c. .... | 30 | 11 | 4 | | | |
| Timber, and repair of Buildings.... | 11 | 19 | 0 | | | |
| Seeds, &c. ...................... | 8 | 18 | 3 | | | |
| Sundries ........................ | 30 | 0 | 9 | | | |
| Water Rate...................... | 2 | 7 | 6 | | | |
| Flower Pots .................... | 15 | 10 | 0 | | | |
| Fuel........................... | 2 | 4 | 0 | | | |
| Ploughing ..................... | 3 | 7 | 6 | | | |
| *Total Gardens* ........ ... | .. | | | 645 | 6 | 7 |
| 1882.<br>Jan. 13—Balance to credit in Commercial Bank .................. | .. | | | 15 | 0 | 6 |
| | | | | £1061 | 4 | 10 |

Audited and found correct.

FRANCIS BUTLER.
JOHN MACFARLANE.

*28th January*, 1882.

## *STATEMENT of the* MORTON ALLPORT *Memorial Fund,* 1881.

| 1881. | Dr. | £ | s. | d. | 1881. | Cr. | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|---|
| Jan. 1. | To balance as per Statement for 1880... | 11 | 0 | 0 | Feb. 1. | By Pass Book............................... | 0 | 0 | 6 |
| 31. | Interest........................................ | 0 | 3 | 3 | Dec. 31. | Balance to credit of Fund ............... | 21 | 10 | 9 |
| Feb. 28. | Interest........................................ | 0 | 0 | 10 | | | | | |
| May 9. | Cash from A. G. Webster, Esq. ...... | 10 | 0 | 0 | | | | | |
| Aug. 31. | Interest........................................ | 0 | 7 | 2 | | | | | |
| | | £21 | 11 | 8 | | | £21 | 11 | 8 |

Examined and found correct.

FRANCIS BUTLER.
JOHN MACFARLANE.

*26th January,* 1882.

## *BOOKS and Periodicals purchased and presented during* 1881.

[Presentations marked thus *.]

Agricultural Gazette, The, current numbers.
* Anthropology, Index to Papers on. From Anthropological Society, London.
Arts, Journal of Society of, current numbers.
Athenæum, The, ditto.
* Adelaide University Calendar, 1881.
* Astronomy.—"The Gem Cluster in Argo." "On a new method of printing Star Maps." "On the Longitude of Sydney Observatory." "On some new Double Stars and Binaries." "Recent changes on the surface of Jupiter." "Astronomical Results for 1877-8, Sydney. By H. C. Russell, Esq., B.A., Sydney." From the Author.
* Academy, American, of Arts and Sciences, Proceedings of, 1877 to 1880. From the Academy.
* ———, Connecticut, of Arts and Sciences, Transactions, vol. 3, part 2, vol. 4, part 1. From the Academy.
* Association, American, for advancement of Science, Proceedings, vols. 26 and 27, 1877-8. From the Association.
* ———, Historical and Archæological of Ireland, Journal of, vol. 5, Nos. 39 to 41. From Dr. Agnew.
* Botanical Enterprise of the Empire, The. By F. Thiselton Dyer, M.A., B.Sci., F.Z.S., F.R.S. From the Author.
* ——— Gardens, St. Petersburg. Report, tome 7. From the Director.
* Catalogue of New Zealand Court, Melbourne Exhibition, 1880. From the Commissioners.
* ——— Bibliotheca Schimperiana, 1881. From the Author.
Catalogues, British Museum. Coleopter, part 1, 1879. Lepidoptera, parts 3, 4, 5. Birds, part 5.
——— of Library of Royal Colonial Institute, London, 1881.
* Comet 1, on Orbit elements of, by J. Tebbutt, F.R.A.S. From the Author.
* Coast Survey, United States, Report of, 1877. From United States Government.
* Entomologisk tidskrift, Band 1, 1880; Heft 1 and 2, 1880. By Jacob Spanberg. From the Author.
* Expedition, Norwegian North Polar, 1878, Chemistry of, by B. H. Tornoe; Zoology of, by Robert Collet. From Government of Norway.
* Essex Institute, Salem, U.S. America; Bulletin of, vols. 10, 11; Historical Collections, vols. 14, 15, 16. From the Institute.
* Engineers and Shipbuilders in Scotland, Institution of, Transactions of, vol. 23, 1879-80. From the Institution.
Florist and Pomologist, The, current numbers.

Fishes, the Study of, by Dr. Günther.
* Flora of British India, by Sir J. D. Hooker, part 8. From the India Office.
* Fern World, The, by F. M. Bailey, F.L.S. From the Author.

Gardener's Chronicle, The, current numbers.
Geological Magazine, The, ditto.
* Geological and Geographical Survey of the Territories, United States, publications of, vols. 2, 3, 4, 5, 6, bound 4to. Bulletin, vol. 4, Nos. 2, 3, 4; vol. 5, No. 1; vol. 6, No. 1. Survey of Colerado, 1876, Idaho, 1877. Report of Entomological Commission, 1877. Bibliography of North American Invertebrate Palæontology. Catalogue of Publications. Report, vol. 12. From the United States Government, per F. V. Hayden, U.S. Geologist.
* Geology of Wisconsin, 1 vol. and Maps. From T. C. Chamberlin, Chief Geologist.
* Geological Survey of India, Memoirs of, vol. 15, part 2; vol. 17, parts 1 and 2. Palæontologia Indica, Series 14, vol. 1, part 1. Series 13, parts 1 and 2; Series 10, vol. 1, parts 4 and 5. Records of Survey, vol. 12, part 4, 1879; vol. 13, parts 1 and 2, 1880.
* Geology and Mineralogy, vols. 1 and 2 (Bridgewater Treatise), by the Rev. William Buckland, D.D., 1837. From H. J. Buckland, Esq.
* Geologische Montanistisch Historische Monographie, by Dr. E. Rayer, Berlin. From the Author.
* Geologique, Internationale Congres de, Report, 1881. From T. Stephens, Esq.

* Institute, New Zealand, Proceedings of, vol. 13, 1880. From Dr. Hector, C.M.G., F.R.S.
* ———, Essex, Salem, Mass., U.S.A., Bulletin, vols. 10, 11. Historical Collections, vols. 14, 15, 16. From the Institute.
* ———, Canadian, Proceedings, vol. 1, part 1. From the Institute.
* ———, Royal Colonial, Proceedings, vol. 11, 1879-80. From the Institute.
* Imports and Exports, Special, by J. K. Cross, M.P. From the Cobden Club.

* Lincei, R. Accademia dei, Transunti, vol. 5., fasc. 1-14, 1881.
* Longitude of Sydney Observatory, 1880, by J. Tebbutt, F.R.A.S.

Magazine, Country Gentleman's, The, current numbers.
* Meteorology, Rate of Barometer changes in British Isles, 1880, by G. M. Whipple. From Meteorological Office, London.
* Meteorology, Report of Kew Committee, 1880. From Meteorological Office, London.
* ———, Report of International Committee Meeting at Berne, 1880. From Meteorological Office, London.
* ———, Report on New Zealand, 1880. From Dr. Hector, C.M.G., F.R.S.
* ———, Note on a Scale for correcting Barometer readings, by H. C. Russell, B.A.

* Meteorology, Results of Observations in New South Wales in 1876-7-8-9. Results of Rain and River Observations in N.S. Wales, 1880. Thunder and Hail Storms in N. S. Wales, 1880, by H. C. Russell, B.A. From the Author.
* ————, Indian, for 1880, and January 7, February and March, 1881. Memoirs of ditto, vol. 1, part 5, 1881. From the Government of India.
* ————, Washington Weather Reports, daily, November and December, 1874, January, 1875, January to May, 1877. Report for 1879. Weather Review, May, 1881. From Government of America.
* Meteorological and Magnetical Observations, Bombay, 1871 to 1878.
* ———— Observations, Calcutta, July, 1880. From Government of India.
* ———— and Magnetic Observations in North America, by Sir J. H. Lefroy. From the Author.
* Mollusca, Recent, found at Port Jackson, by J. Brazier, C.M.Z.S., &c. From the Author.

————, Iles Australiennes, Localités des, des Iles Salomon, et d'autres Iles de la Mer Sud. From the same.

* Mining in California, Report on, by G. Thureau, F.G.S. From the Author.
* Museum, United States National, Catalogue of, 1879.

Nature, current numbers.

* Naturhistorischen vereins, Verhandlunges des, 1879-80.
* Naturwissenschaftlichen vereins, Verhandlungen des; 1880.
* Newspaper, File of a Ms., the first published at Waratah, Mount Bischoff. From His Excellency Sir J. H. Lefroy.
* Observatory, United States Naval, Washington—Observations, 1869 to 1871. Appendix 1870, 1872, 1874, 1876. Tables of Transit Observations, 1872. Catalogue of Stars. Researches on Motion of the Moon. The "Lick," Report of Observations on Mount Hamilton, 1880.
* Plants, The, of North-western Australia, by Baron F. Von Müeller, K.C.M.G., M.D., F.R.S.
* Report of Colonial Museum, Wellington, New Zealand, 1880. From Dr. Hector.
* ———— Launceston Mechanics' Institute, 1880.
* ———— Mining Surveyors, Victoria.
* ———— Auckland Institute Museum.
* ———— Director of Botanic Gardens, Adelaide.
* Reliquiæ Diluvianæ (Organic Remains), by the Rev. W. Buckland, D.D., 1823. From H. J. Buckland, Esq.
* Rainfall, British, 1879, by G. J. Symons. From Sir J. H. Lefroy, K.C.M.G.
* Reciprocity Craze, The, by G.W. Medley. From the Cobden Club.
* ————, The French Treaty and, by Joseph Chamberlain, M.P. From the Cobden Club.
* Science Record, The Southern, current numbers. From the Publisher, Melbourne.

* Statistics of Victoria, 1879.
* —— —— New Zealand, 1879.
* ———— Tasmania, 1880.
* Society, Asiatic, of Japan, Transactions of, vol. 8, parts 3 and 4; vol. 9, parts 1 and 2. From the Society.
* ————————, Royal, Journal of, vol. 11, part 3; vol. 12, parts 1, 2, 3; vol. 13, part 1. From the Society.
* ———, Royal Microscopical, Journal of, vol. 3, parts 6 and 6A; Series 2, vol. 1, parts 1 to 5 inclusive. From the Society.

———— ———— Astronomical, Monthly Notices, vol. 41, Nos. 1 to 9, 1881. Memoirs, vol. 41, 1879; vol. 45, 1880. From the Society.

* ——————— of Victoria, Transactions, vol. 17, 1880. From Society.
* ——————— of South Australia, Proceedings, vol. 3, 1879-80. From Society.
* ———— —— London, Proceedings, vols. 31, 32, parts 206 to 213 inclusive. From the Society.
* ———, Meteorological, Quarterly Journal of, current parts. From Society.
* ———, Linnean, of New South Wales, Proceedings of, vol. 5, parts 3, 4; vol. 6, parts 1 & 2. From Society.
* ———, Acclimatisation of Canterbury, New Zealand, Report, 1880.
* ———, Malacological of Belgium, Annals of, 1881. Proces verbaux, tome 8, 9, 1879-80.
* ——— Royal of New South Wales, Proceedings, vol 4, 1880.
* ———— —— Historical, Transactions, vol. 9, 1881. From Society.
* ———— —— Geographical, Proceedings, parts 2 to 12, 1880; 1 to 3, 1881. Journal of, vol. 49, 1879.
* ———, Geological of London, Quarterly Journal of, vol. 26, Nos. 141 to 144; vol. 27, No. 145. List of Fellows, 1880. From the Society.
* ———, Zoological, London, Proceedings of, part 4, 1879; parts 1, 2, 3, 1880, &c. From Society.
* ———, Linnean, Journal of, vol. 17, Nos. 103 to 105; vol. 18, Nos. 106 to 110 (Botany); vol. 15, Nos. 81 to 84 (Zoology).
* ———, Statistical, Journal of, vol. 43, No. 4. From Society.
* ———, Malacological of Belgium, Annals, vols. 9 to 11, 1874-1876. From the Society.
* ———, Leeds Literary and Philosophical, Report of, 1880-1.
* Skies, The Southern, a Lecture delivered by His Excellency Sir John Henry Lefroy, K.C.M.G. From the Author.
* Tree culture in South Australia, Treatise on, by J. E. Brown, F.L.S. From the Author.
* Ditto, Duplicate copy, presented by the Trustees of the Public Library, Hobart.
* Trigonometrical Survey of India, Account of, vols. 2 to 5, 1879-81. From the Secretary of State for India.
* Uranus and Jupiter, Note on Opposition of, 1880, by John Tebbutt, F.R.A.S. From the Author.

* Zoology, Museum of Comparative, Harvard College, Cambridge, U.S.A., Bulletin of, vol. 4; vol. 5, Nos. 2 to 10; vol. 6, Nos. 8 to 11. Memoirs of, vol. 5, part 2; vol. 6, No. 1, parts 1 and 2; vol. 7, No. 2, part 1. From the Museum.

* ——— of Norwegian North Atlantic Expedition, part 3, 1881. From Norwegian Government.

## *LIST of Donors to the Museum during* 1881.

[For particulars of Donations see Lists in Monthly Proceedings.]

Aikenhead, W., Esq.
Boon, Captain.
Brown, Rev. George.
Barnard, J., Esq.
Burgess, W. H., Esq., M.H.A.
Brown, Justin M'C., Esq.
Bromfield, T. H., Esq.
Chick, Mr. R.
Conrad, Mr.
Carson, Mr.
Dyer, Mr. R. B.
Drew, Rev. H.
Doodie, Mr.
Exton, Mr.
Exhibition (Melbourne) Commissioners for Tasmania.
Finlayson, Mr.
Fitzgerald, Mr. O.
Glover, C. H.
Gellibrand, Hon. W. A. B.
Gifford, Mrs.
Gawne, E. B., Esq.
Henry, R., Esq.
Ives, Mr., barque *Ethel.*
Johnston, R. M., Esq.
Johnston, J. W., Mr.
Jackson, A., Mr.
Lefroy, His Excellency Sir John H., K.C.M.G., C.B.
Lipscombe, E., Mr.
Lamb, H., Esq., M.H.A.
Lodder, Mrs.
Lewald, D., Mr.
Moore, J., Mr.
Murray, Mrs. W.
Macfarlane, Dr.
Murray, W., Esq.
M'Donald, J., Mr.
Nairn, C. C., Esq.
Pulleine, Master
Rayner, Mr.
Rapp, Captain.
Stephens, W. R., Esq.
Swan, E. D., Esq.
Simpson, J., Esq.
Stewart, Master.
Sheridan, R. B., Esq.
Stephens, T., Esq., M.A.
Tarleton, W., Esq.
Terry, Mr.
Taylor, A. J., Mr.
Wright, Mr.
Weld, His Excellency Sir F.A. (Singapore.)
Wintle, S. H., Esq.
Wilkins, Mr. A.
Ward, Prof. H.A. (Rochester, New York).
Watchorn, Master B.
Weston, Maurice, Esq.

## EXCHANGES OF PLANTS AND SEEDS DURING THE YEAR 1881.

From Messrs. J. Vietch & Co., London—1 case Pelargoniums.

From Dr. J. H. King, Superintendent Botanic Gardens, Howrah, Calcutta—20 packets seeds.

From Director of the Royal Gardens, Kew, near London—Seeds of new variety Cedar, cuttings Willows.

From Baron Ferd. Von Müeller, Government Botanist, Melbourne—Numerous sendings of seeds, bulbs, &c.

From Chamber Agriculture, Washington, United States—Numerous packets seeds.

From Mr. J. Latham, Liverpool-street, Hobart—Imported seeds and bulbs.

From Mr. C. F. Creswell, Melbourne—Seeds and bulbs.

From Mr. J. Sangwell, Melbourne—Case containing 48 ferns.

From Mr. Wm. Bull, King's Road, London—30 packets seeds.

From Mr. J. F. Duthie, Superintendent Botanic Gardens, Saharunpur, North West Province, India—7 packets seeds.

From Mr. J. Smith, Nurseryman, Riddel's Creek, Victoria—45 fruit trees.

From Horticultural Society's Gardens, Melbourne, Victoria—Collection new fruit scions.

From Rev. R. H. Codrington, Norfolk Island—Seeds N.I. pine.

From Mr. J. B. Mather—Plant Anthocercis Tasmanicum.

From Mr. W. R. Guilfoyle, Director Botanic Gardens, Melbourne—Numerous plants and seeds.

From Mr. G. Brunning, Nurseryman, near Melbourne—40 rose plants.

From Miss Solly, Hobart—5 packets seeds.

From Messrs. Shepherd & Co., Nurserymen, Sydney—case plants.

From Captain Fisher, Hobart—12 New Zealand ferns.

From Monsciur J. Verschaffelt, Ghent, Belgium—Case Rhododendrons.

From Mr. S. Purchase, Nurseryman, Sydney—Case Norfolk Island pines.

From Messrs. Hugh Low, Nurserymen, London—case plants.

From Dr. R. Schomburgk, Director Botanic Gardens, Adelaide—case plants.

From Monsieur J. Linden, Ghent, Belgium—Case camellia and azalea.

To Hugh Low & Co., London—Plants araucaria and tree ferns.

To Monsieur J. Verschaffelt, Ghent, Belgium—6 tree ferns.

To Dr. Schomburgk, Botanical Gardens, Adelaide—Seeds and sphagnum moss.

To the Botanical Gardens, Melbourne—Seeds, plants, and moss.

To the Royal Gardens, Kew, London—Seeds eucalypti.

To Messrs. Vilmorin, Andrieux, Paris—Seeds.

To Baron Ferd. Von. Müeller—Seeds, various.

To Mesrs. Veitch & Sons, London—6 tree ferns.

To the Botanic Gardens, Sydney—Sphagnum moss.

To Monsieur J. Bourdil, Paris—Seeds, hardy eucalypti.
To Sir A. Stepney, South Wales—Seeds, hardy eucalypti.
To Mr. J. Smith, Melbourne—Seeds, plants, and sphagnum moss.
To Mr. G. Brunning, Melbourne—Plants, seeds, and moss.
To Messrs. Shepherd & Co., Sydney—Plants and seeds.
To Mr. C. F. Creswell, Melbourne—Plants and seeds.
To the Horticultural Society, Melbourne—Plants and bulbs.
To the Commander H.I.J.M.S. Riujio—75 packets seeds.
To Mr. S. Purchase, Sydney—Bulbs and seeds.
To Mr. J. Sangwell, Melbourne—Plants and seeds.
To Messrs. Ch. Huber Cie., Paris—Seeds, eucalypti.
To Mr. E. B. Heyne, Adelaide—Seeds and bulbs.

F. ABBOTT, *Superintendent.*

## PLANTS INTRODUCED INTO THE ROYAL SOCIETY'S GARDENS DURING 1881.

Acacia concinna
Actinomeris squarrosa
Adiantum amabile
„ Ghiesbrachtii
„ Henslowianum
„ nobile
„ scutum
„ tinctum
„ villosum
„ Williamsi
Albizzia Saman
Aleurites Mexicana
Allomanda violacea
Amaryllis blanda
Ampellopsis indivisa
Amphicarpum Purshii
Anenome cylindrica
Ansonia tabernemontana
Aphelandra fascinata
Aralia edulis
Araucaria elegans
Asclepias cornuti
Ascyrium, stans
Aspidium Sieboldii
Asplenium Sieboldii
Asplenium Goringianum
„ diversicolor
„ Yeylanicum
Aster oblongifolia
„ puniceus
„ viminea
Berberis Fremonti
Blechnum Braziliense
„ lævigatum
Bracteolaria racemosa
Brunsvigia Guilfoylei
Calodendron capense
Cheilanthes tomentosa
Chrysopus mariana
Cimicifuga racemosa
Clematis coccinea
Cornus capitata
„ florida
„ sericea
Cotoneaster affinis
Crinum uniflorum
„ mauritanicum
Cyathea Boylei
„ princeps
Dahlia Maximillana
Davallia canariense
Desmodium acanthifolium
Dioscorea villosa
Dipladenia Boliviensis
Diplazium Shepherdi
Doris scandens

Doryopteris nobilis
Eranthemum roseum
Eriocaulon decangulare
Eryngium Yuccæfolia
Erythrina caffra
Eucalyptus acmenioides
„ botryoides
„ cineria
„ diversicolor
„ dumosa
„ eugenoides
„ hæmastoma
„ incrassata
„ leucoxylon (white)
„ leucoxylon (red)
„ marginata
„ occidentalis
„ patens
„ plattypus
“ rudis
Eugenia eucalyptoides
Ficus macrophylla alba
Flamingia semialata
Goldfussia calyptrata
Goniopteris pennigera
Gymnogramma Pearcei
Hebenaria tridentata
Hedera arborea aurea
Hodginsonia ovalifolia
Hovenia dulcis
Hypolepis Dicksonioides
„ millifolium
Ilex, Golden Queen
„ Madariensis
„ Shepherdi
Iris versicolor
Ixia grandiflora
„ secunda patens
Jacaranda alba
Juniperus japonica aurea
Lastrea felix-mas recurva
Lepachis pinnata
Lespedeza violacea
Leucadendron glabrum
Lixtris pycnostachya
„ scariosa
Ligustrum tricolor
Littonia modesta
Lomaria diversicolor bipinnatisecta
Lomaria Fraseri
„ Gibbosa
Lycopodium glabellatum
Melaleuca armillaris
„ laterita
Mikania Guaco
Myrica Californica
„ rubra
Myrsine bifaria
„ chatamica
Nephelium leucocarpum
Nephroduim glabellum
„ melanocaulon
„ molly corymbiferum
„ palmatum
Nephrolepis davallioides
Nerium alba pleno
Nothochlæna cyrysophila
„ nivea
Osmorrhiza trivistylis
Pentstemom digitale
Petalostemon candidum
Phaseolus helvelus
Picea nobilis
Pilea grandis
Plattyloma atropurpurea
Polypodium pennigerum
„ vacillans
Pothos aurea
Pteris geranifolia
„ hastata
„ longifolia
„ longifolia cristata
„ mucilenta
„ scaberula
„ semi-pinnata
„ serrulata Applebyana
Quercus elegantissima
„ new variegated evergreen
Randia Chartaoa
Rhamnus lanceolatus
Rhodoleia Championi
Rosa blanda
„ gymnocarpa
Selaginella sitrosa
Senecio pulchra
Sideroxylon argenteum
Silphium perfoliatum
Solidago canadensis
„ nemoralis
„ serotina
Sterculea Bidwilli
„ quadrifida
Sterocarya stenoptera
Strophanthus capensis
Tetranthera ferruginea

Torenia Bailloni
„ Tourneri
Tristrania laurina
„ nerifolia
Tupidanthus calyptratus
Ulmus amplexicaulis
Vernonia fasciculata
Vernonia nova-borensis
Viburnum cotinifolius
„ oxycoccus
Wistaria Bidwilli
„ Megasperma
Woodwardia orientalis
„ radicans

### *Camellia.*

Alessandro Rossi
Alfredo Capellini
Angelo Cocchi
Archduchesse Marie
Auguste Delfosse
Carlotta Petroso
Chats
Clodia
Corrodino
Contessa Tozzoni
„ Ramphi
Don Carlos Ferdinando
Don Pedro the Fifth
Elvini Delli
Elvira Bianchini
Giardino Giaberti
„ Santarelli
Il Cygne
Italia unita
Jardin d'Hiver
Jubile
Madame Ambroise Verschaffelt
„ Cachet
„ Rudolph Abel
Marie Morren
Ornatissima
Planipetala
Poldina Vanturi
Prima Donna
Principessa Clothilde
Solfaterre
Souvenir d'Emile Defresne
Venus de Medicis

### *Azalea.*

Ami Gustave Guilmot
Charmer
Chloris nova
Comte Charles de Kerchove de Denterghem
Comte de Flander
Dr. Moore
Duc Adolph de Nassau
Eugene Mezel
Frau Johanna Winkler
Furstin Bariatinski
Iveryana
John Gould Veitch
James Veitch
Koniger Cleopotra
La Gloire
Madame de Ghellinck
„ Mendel
„ Van der Cruyssen
„ Van Eeckhaute
Mammoth
Raphael
Reine des Pays Bas
Roi de Holland
Souvenir de Prince Albert

### *Rose.*

Abel Grand
Baron Chauraud
„ Noirmont
Climbing Charles Lefebvre
„ Jules Margottin
Comte Raimbaud
Countesse Rosebery
John Bright
Lord Clyde
Madam C. Kuster
Madam Morren
Marquis Mortmart
Maurice Bernardin
Pet
Red Dragon
Richard Laxton
Souvenir de Spa
„ de Monsieur Boll
T. C. Cole

### *Caladium.*

Agrippana
Alfred Blue
Duchardi
Duc de Cleveland
Harold
Herbyanum
Mayerbeer
Proserpine
Uranus

### *Pelargonium.*

Corsair
Diadem
Faust
Fortitude
Jeanette
Madame Thibaut
Maid of Kent
Marie Lemoine
Mermeris

### *Apple.*

Baxter Pearmain
Bromley Seedling
Cogswell
Early Almond
Foxley
Green New Town Pippin
Grey Leadington
Lady Hanniker
Minier's Dumpling
New French Hawthornden
Peasgood's Nonsuch
Pennock
Peter the Great
Prince Bismark
Reinette Jaune Musque
Stamford Pippin
Striped Beaufin
Twenty-ounce
Winesops
Wyken Pippin

### *Pear.*

Brockwith Park
Claps' Favourite
Enfant Prodique
Hyshe's Prince Consort
Madame Millet
,, Treyne
Suffolk Thorn

### *Plums.*

Brahey's Green Gage
Denbeigh
Dove Bank
Fellemberg
Guthrie's Late Green
Leigel's Apricot
Prince Engelbert
Washington

### *Cherry.*

Ashton
Belle de Choisy
Biggerreau de Holland
Early Lyons
Early Purple Guigne
St. Margaret

### *Gooseberries.*

Antagonist
Chesshire Lass
Clayton
Companion
Green Overall
Lady Leicester
Leveller
Ploughboy
Queen of Trumps
Shiner
Slaughterman
Snowball
Speedwell

F. ABBOTT, *Superintendent.*

WILLIAM THOMAS STRUTT,
GOVERNMENT PRINTER, TASMANIA.

OF

# TASMANIA,

FOR

1882.

THE responsibility of the statements and opinions given in the following papers and discussions rests with the individual authors; the Society as a body merely places them on record.

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# PROCEEDINGS.

## APRIL, 1882.

A monthly meeting of the Society, the first of the present session, was held at the Museum, on Monday, April 17. Mr. Justin McC. Browne in the chair.

Mr. W. F. Ward, Government Analyst, who had previously been nominated by the Council, was balloted for, and declared unanimously elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought forward the usual returns, viz.:—

1. Number of visitors to Museum, January—On Sundays, 634; on week days, 1,400; total, 2,034. Do. February—On Sundays, 613; on week days, 1,022; total, 1,835. Do. March—On Sundays, 499; on week days, 969; total, 1,468.
2. Do. Gardens, January, total, 7,577.
   Do. do. February, total, 6,383.
   Do. do. March, total, 5,536.
3. Plants, etc., sent from and received at Gardens:—
   January—Received from De Smet Freres, Ghent, Belgium, 2 cases Rhododendrons, Clematis, and Peony. From Chamber of Agriculture, Washington, United States, 55 papers of seeds. From Baron von Müeller, Melbourne, bulbs of *Crinum uniflorum*. Sent to De Smet, Ghent, 7 Tree Ferns.
   February—Received from Mr. Kayser, Mount Bischoff, seeds of *Acacia rhombifolia*. Sent Mons. J. Linden, Ghent, 6 Tree Ferns. Received from Vilmorin, Andrieux, et Cie., Paris, 11 packets seeds.
   March—Received from Vilmorin, Andrieux, et Cie., Paris, 10 packets seeds. From Chamber of Agriculture, Washington, U.S.A., 16 packets seeds. Sent to Messrs. Law, Somner, and Co., Melbourne, seeds of Clianthus. To Mons. August von Geert, Ghent, 6 Tree Ferns. To De Smet Freres, Ghent, 6 do.
4. Books and Periodicals received, January, February, and March.
5. Presentations to Museum.

*Meteorology.*

1. From the Marine Board, Hobart. Tables from Mount Nelson for January, February, and March; South Bruny for January and February; Goose Island, do.; Swan Island, King's Island, and Kent's Group, for January.
2. From Mr. Roblin. Tables of results of Meteorological Observations taken at the lighthouses and Mount Nelson during the year 1881.
3. From Mr. F. Abbott, jun. Monthly tables of Rainfall at Society's Gardens. During January, 1·06in.; February, 1·01in.; and March, 0·65in.
4. From Mr. Kayser. Do. at Mount Bischoff during March, 3·34in.
5. From Mr. D. C. Purdy. Do. at Macquarie Harbour, do., 2·09in.
6. Rainfall at Mount Nelson, January, 1·64in.; February, 1·51in.; and March, 0·49.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during January, February, and March:—

January 8. Veronica angustifolia in full flower.
" 10. Apricots commenced to ripen (Roman).
" 16. Grevillea robusta in full flower.
" 18. Jargonelle Pear ripe,

January 24. Black Mulberry commenced to ripen.
February 10. Kerry Pippin Apple do.
" 15. Windsor Pear do.
" 20. Bon Chretien Pear do.
" 22. Green Gage do.
" 25. Ash commencing to shed seed.
" 27. Sycamore do.
March 14. Seckle Pear commencing to ripen.
" 16. Tips of Hornbeam commencing to turn.
" 18. Coe's Golden Drop Plum ripe.
" 28. Horsechestnut leaves turning brown.
" 28. Ash leaves turning yellow.
" 30. Oak leaves commencing to fall.
" 31. Tips of Elm turning yellow.

The presentations to the Museum were as follow:—

1. From Mr. J. A. Clark, Franklin. Stalactite, from a recently discovered natural tunnel, running through a hill on the Craycroft River, Huon district.
2. From Mr. V. Johnston. A specimen of the "Ribbon Fish" (Trachypterus a'tivelis), caught off Darlington, Maria Island, East Coast Tasmania.
3. From Mr. S. P. H. Wright. Specimens of the various strata passed through in boring for water at The Grove, Glenorchy.
4. From Mr. A. P. Canaway. Specimens of the paper money (Assignats) of the First French Republic (1793-1805).
5. From Mr. John Page. Nine Snake Skins, from the Eastern Marshes.
6. From Mr. D. M. Barnard. Skin of Black Snake (Hoplocephalus curtus), from Beaconsfield. In a note which accompanied this specimen, the donor states that "The snake was originally 6ft. in length, the skin is now 5ft. 10in., without head, and allowing for shrinking."
7. From Mr. J. Barnard. 89 Copper Coins and Tokens, and 4 Silver Coins. [Among the latter is a Specimen, in excellent preservation, of the "dump" struck from the centre of the Dollar, and formerly in circulation in the colony. It bears the date 1813, and its value, 15 pence, is stamped on the reverse side.]
8. From Master Stephens. Two specimens of Unio Moretonicus, from the Lake River.
9. From Miss Lodder. 73 Species of Marine Shells, from North Coast, Tasmania.
10. From the Trustees, Australian Museum, Sydney. 108 Specimens of Foreign, and 121 of Australian Birds, mounted; three Heads of Egyptian Mummies.

Presentations to Library:—

1 From Captain W. V. Legge, R.A. Two Photographs of the Chaldæan Account of the Deluge, taken from Terra Cotta tablets found at Nineveh, and now in the British Museum, with translation and text by George Smith, of the Oriental Department, British Museum.
2. From Trustees British Museum, Catalogue of Birds, Vol. 6.
3. From the Government of Victoria. A descriptive Atlas of the Eucalypts of Australia (Eucalyptographia), 5th Decade, by Baron von Mueller, K.C.M.G.

The SECRETARY called special attention to the extent and value of the donation (No. 10) from the Trustees of the Australian Museum, as an act of great liberality, especially coupled with the promise of a future gift of skins of New Guinea Birds, whenever mounted specimens are available for the purpose. "In exchange, the Trustees would be glad to receive skins or skeletons of Thylacines (Native Tigers), and skulls or skeletons of small Whales; also, fresh water Fishes and Crustaceans."

The SECRETARY read a letter from Baron F. von Müeller, K.C.M.G., with a short paper entitled, "Remarks on the Vegetation of King's Island."

Mr. R. M. JOHNSTON, F.L.S., followed with a "Note and Description of the first discovered representative of the Genus *Pupa* in Tasmania," with a drawing of the Shell.

The meeting closed with a vote of thanks to the writers of the papers and to the donors to the Museum, making especial mention of the presentation of Birds from the Australian Museum, and of Shells from Miss Lodder.

At 8 o'clock the members adjourned to the upper rooms of the Museum, when an exhibition of the telephone took place, at which a number of ladies were present by invitation. Mr. R. Henry, the superintendent of telegraphs, conducted the proceedings, and commenced by giving a lucid and interesting description of the construction and uses of the instrument. Communication was made with Pearson's Point, Mount Nelson, and Battery Point; the extreme distance traversed being about 20 miles. The experiments were very successful, and afforded much gratification to those who witnessed them. Twelve telephones were employed on the occasion, by which means the various messages and replies were made audible to a number of persons simultaneously. In addition to conversation held between the several stations, music and singing were introduced, the airs being distinctly heard in the room.

In conclusion, Mr. Henry gave explanations of the working of the phonograph and microphone, which were attentively listened to.

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## MAY, 1882.

The monthly evening meeting of the Society was held on Tuesday, 9th May, His Honor Mr. Justice Dobson, V.P., in the chair.

Mr. Fleetwood Wilson was balloted for, and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following Returns for the month of April, viz.:—

1. Number of Visitors to Museum—On Sundays 959, on week days 777; total 1,736.
2. Ditto to Gardens, total 4,880.
3. Plants and seeds received at and sent from Gardens.
4. Presentations to Museum.
5. Books and periodicals received.

*Meteorology.*

1. From Hobart Marine Board. Tables from Swan Island for March, South Bruny for do., and Mount Nelson for April.
2. From Captain Shortt, Meteorological Observer. Mean of Observations taken at Hobart during April, 1882. Result of Rainfall at Southport during do.
3. From Mr. H. W. F. Kayser. Register of Rainfall at Mount Bischoff do.
4. From Mr. F. Abbott, jun. Do. at Botanic Gardens do.

The following are the results of the observations above referred to:—

Hobart, April, 1882.

*Barometer—Mean, 29·696.*

Thermometer—Means, Max., 61·1deg.; Min., 45·2deg.; Dry, 54·4; Wet, 51·5.

Humidity of Air—Means, Dew Point, 48·54deg.; Humidity, ·814; Elastic Force of Vapour, ·346.

Condensation—Number of days on which rain fell, 13; amount collected, ·90in.

Cloud—Mean daily amount 5 (scale 0-10).

Wind—Mean force 1·3 (scale 0-12), principally from westward; light airs and calms prevailing during the month.

Remarks—"In the above the rain was taken for the month, the other observations for the last 24 days only. The greatest temperature in shade was 74·8deg. on the 10th, the lowest 37·0deg., on night of the 6th. On the evening of the 17th, the Aurora Australis was very brilliant, commencing a little before 8 o'clock, and lasting nearly all night, streamers of light ascending to the zenith from between the S.E. and S.W., illuminating the heavens and making it as light as if the moon was up. It was said to be the grandest Aurora seen in Tasmania. A smaller Aurora appeared on the evening of the 20th, but with no streamers. Calms and light winds prevailed through the month, though heavy gales have been experienced on the coasts of Tasmania and other Colonies."

J. SHORTT, Meteorological Observer.

Southport Rainfall, April, 1882.—Number of days on which rain fell, 14; amount collected, 2·55in.

Waratah, Mount Bischoff, April.—Number of days on which rain fell, 18; amount collected 5·27in.

Botanic Gardens, Hobart.—Number of days on which rain fell, 9; amount collected, 0·58in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during April, 1882:—

10th. Chinese Chrysanthemums commencing to flower.
12th. Elm leaves commencing to fall.
12th. Coe's late red Plum commencing to ripen.
20th. Pyrus aucuparia leaves commencing to fall.
24th. Black mulberry ditto ditto.
26th. Seeds of Hornbeam ripe.

The presentations to the Museum were as follow:—

1. From Mr. F. Bednall, Adelaide, per Mr. C. E. Beddome, two Specimens of *Voluta flavicans*, and one of *Cypræa thirsites*.
2. From Mr. E. D. Swan, a Specimen of *Nautilus pompilius*, and one of *Nautilus umbilicatus*.
3. From Mr. H. White, two Specimens of Copper Pyrites, from Saxon's Creek, near Beaconsfield, Tasmania.
4. From Mr. W. K. Dixon, Ouse, a Specimen of a Petrel *(Prion turtur)*.

[No particulars furnished with this specimen, which had probably been driven inland by the severe weather lately prevailing on the coast.]

5. From Mrs. Percy, Rokeby, Clarence Plains, a Basket and Eggs from a petrifying spring at Matlock, Derbyshire, England.
6. From Mr. Justice Dobson, a specimen of the Fern *Schizea bifida*, found near the Cascade Brewery.

[The donor of this specimen remarks—"This fern has hitherto, so far as is recorded, been found only at Southport in this colony. The Schizea found at George Town and on the North Coast, which is commonly known as '*Schizæa bifida*' on Hooker's authority, is, according to Bentham, p. 698, not '*Schizea bifida*,' but '*Schizea fistulosa*.'"]

To Library—

1. Annals of the Entomological Society of Belgium, Vol. 25, 1881. From the Society.
2. *Catalogue of the* Australian Stalk and Sessile-eyed Crustacea, by William

A. Haswell, M.A., B.Sc. From the Trustees of the Australian Museum, Sydney. (Two copies.)

8. Smithsonian Miscellaneous Collections, Vols. 6 and 7. Report, 1865. From the Smithsonian Institute, Washington, U.S.A.

Mr. Barnard read a paper, entitled "Notes on the economic value of the aquatic plant *Typha latifolia.*"

Some conversation followed the reading of this paper, after which Mr. J. B. Walker read a communication from Mr. G. McIntyre, of Christchurch, New Zealand, "On the State of the Surveys in Tasmania."

Mr. Stephens said that as the discussion and correspondence on this subject had been started by the quotation of some remarks of his by His Excellency Sir J. H. Lefroy, in a paper read before the Royal Society, he might be allowed to say a few words. The late Mr. J. E. Calder was one of the earliest pioneers in the exploration of the Western country, and from his long experience in the Survey department was entitled to speak with some authority upon the question of land surveying. The author of the admirable paper which had just been read clearly points out the defects of a magnetic survey, and shows that a proper system can be carried out even in the wildest parts of New Zealand. It was almost unnecessary to say that his criticism upon Mr. Calder's letter was conceived and written in no unfriendly spirit, and that at no time had there been any intention to find fault with the surveyors of Tasmania, but only with the system under which they had to work. With reference to some unfavourable remarks which had been made respecting the conduct of the trigonometrical survey, which was unfortunately discontinued before it could be made much use of, he (Mr. Stephens) would read a short extract from the report of Major Cotton, then Deputy Surveyor-General, upon the subject, which was read before the Royal Society on May 10, 1854 :—From the Papers and Proceedings of the Royal Society, Tasmania, Vol. 3, p. 87.—"The observations have been entirely in the hands of one individual, Mr. J. Sprent, whose scientific knowledge, together with untiring perseverance and patient endurance, has enabled him, single-handed, to effect what would in other countries have been shared by many equally qualified for the work. But the result is such as he will, I am sure, from the interest he takes in this work of science, feel no small recompense for his efforts."

A long and interesting discussion then ensued, in which Captain Stanley, Mr. J. M. Clarke, and the Chairman took part.

Mr. C. H. Grant considered the thanks of Tasmanians generally, no less than of the Royal Society, were due to the author of the paper for again calling attention to what was undoubtedly a matter of great regret in the present system of conducting the surveys of the colony. A previous speaker had alluded to the discrepancy between the due North and South lines shown in the survey of the property held by the Van Diemen's Land Co., and what purported to be similar lines in more recent surveys. This was shown in even a more striking manner on the land plan of the township of Somerset, where the lines of the true and magnetic meridian were shown at a considerable angle to each other, leaving a triangular space between them of a "no man's land." He presumed that by the Lands Titles Act the Government guaranteed the owner of each property registered thereunder the correctness of his boundary lines, but this they were practically unable to do under the conflicting systems of survey, which, in his own experience, had been productive of very great embarrassment, expense, and delay. The increasing resources and importance of this colony, and therefore improvement of its landed estate, appeared to make it desirable that a scientific department of the Government should be created, and placed under the charge of a highly competent scientist, who should be specially charged with the superintendence of *the Land Surveys* and of the Meteorological and

Astronomical observations. There would then, he thought, be no difficulty in having the surveyors' field notes sent direct to the central office, and there plotted, with the check lines and angles also furnished, and a well-established conection with a trigonometrical station or some accurately learned point or line. It would doubtless, under existing circumstances, involve too much time, and therefore cost, to connect all surveys with the trigonometrical standard, but the great importance of doing so should always be kept in mind, and every effort made at the central office to correctly plot each new survey on the land plan of the colony; and, as far as practicable, correct any errors discovered, rather than allow them to indefinitely accumulate. The matter of the paper now read being of such great importance, and the necessity of a change in the present system being urgent, he desired to suggest that the Secretary be requested to forward copies of Mr. McIntyre's valuable communication to each of the town and district surveyors of this colony, and that they be asked to favour the society with their views thereon, in order that the subject may be more fully discussed here, and some practical suggestions arrived at for the improvement of the present anomalous system of the land surveys.

A vote of thanks having been accorded to the authors of the papers read, and to the donors of presentations, the proceedings terminated.

## JUNE, 1882.

The usual monthly evening meeting of the Society was held on Tuesday, 13th June, Mr. T. Stephens, M.A., Vice-President, in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for and declared duly elected :—As Fellows of the Society, Mr. William Knight. M.A., and Mr. Patrick Mackay ; as a corresponding member, Mr. George McIntyre, of Christchurch, New Zealand.

The Hon. Secretary (Mr. **Barnard**) brought forward the following returns for the past month, viz.:—

1. Number of visitors to Museum, May—On Sundays 747, on week days 601; total 1,348.
2. Do. to Gardens, 3,319.
3. Plants and seeds received at Gardens :—From Baron von Müeller, Government Botanist, Victoria, a collection of miscellaneous seeds, comprising 402 varities. From Messrs. Shepherd and Co., Sydney, 20 varities of Eucalypti. From the hon. the Colonial Secretary, a packet of seeds of Typha Latifolia, received from the Italian Consul, Melbourne. From Mr. J. Latham, Hobart, a collection of imported seeds.
4. Seeds, etc., sent from Gardens :—To Mr. C. F. Creswell, Melbourne, 20 varieties of seeds and bulbs.
5. Periodicals received.
6. Presentations to Museum and Library.

*Meteorology.*

1. From Captain Shortt, Government Meteorologist. Monthly means of observations taken at Hobart during May.
2. From Mr. F. Abbott, jun., register of rainfall at Botanic Gardens for May.
3. From Mr. H. W. F. Kayser. Do. at Waratah, Mount Bischoff, do.
4. From Mr. D. C. Purdy. Do. at Strahan, Macquarie Harbour for April and May.
5. From the Marine Board, Hobart. Tables from Mount Nelson for May Swan Island for April, South Bruny, for April and May.
6. *From Dr. Hector.* Printed abstracts of observations taken in New

Zealand, from October, 1881, to March, 1882, inclusive; and monthly tables from Wellington for February, March, and April, 1882.

The following are the results of observations above referred to:—

*Hobart, May, 1882.*

Barometer.—Mean, 29·656,

Thermometer.—Means, Max., 55·4deg.; Min., 43deg.; Dry bulb, 50·2deg.; Wet bulb, 47·5deg.

Humidity.—Dew Point, Mean, 43·9deg.; Humidity, do., ·816; Elastic Force of Vapour, do., ·297.

Condensation.—Number of days on which Rain fell, 16; amount collected, 5·91in.

Cloud.—Mean daily amount, 5·9 (scale 0-10).

Wind.—Mean force, 1·8 (scale 0-12); prevailing directions, South and West, and calms.

Remarks.—Rain fell on 16 days. The heaviest fall, registered at 9 a.m. on the 8th, was 1·18in. The greatest temperature in shade, 62deg. 5in. on the 2nd, 11th, and 16th. The lowest on the night of the 19th, 34·8deg. Heavy gales passed over Hobart from the westward on the 7th, 16th, and 17th. Snow fell on Mount Wellington on the nights of the 2nd, 6th, and 31st. The Aurora Australis appeared about 10hrs. 30min. on the night of the 14th, but not very brilliant, and with no streamers. Foggy on the morning of the 27th. A few cold and frosty nights. Wet month throughout. The fall of rain for month, 5·91in.

J. Shortt, Meteorological Observer.

Rainfall Botanic Gardens, Hobart, May.—Number of days on which rain fell, 14; amount collected, 4·49in.

Do. Waratah, Mount Bischoff, do.—Number of-days, 27; amount collected, 14·55in.

Do. Strahan, Macquarie Harbour, April.—Number of days, 14; amount collected, 4·73in. Do. May.—Number of days, 21; amount, 7in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during May:—

8th. Dutch Medlar, commencing to ripen.
16th. Photinia serrulata, commencing to flower.
20th. Diosma alba, do.
25th. Ailanthus, leaves all shed.

The presentations were as follow:—

To Museum—

1. From Captain Langworthy. Specimen of a rare Fish (*Gastrochisma melampus.* Rich.), caught off the mouth of the Derwent. [Mr. R. M. Johnston remarks:—"This is the second specimen only of the fish known. It should be preserved if possible."]
2. From Mr. J. H. Grant. A Stockwhip Handle, made from a Queensland wood known as "Ringed Giddia." In a note which accompanied this presentation, the donor refers to the wood of which it is formed as one of the handsomest in Queensland, and adds:—"It was made by a half-caste stockman on the Paroo River, who merely used a knife, glass, and sand-paper for the purpose."
3. From Mr. George Fry, per the hon. Minister of Lands and Works. A fine specimen of Tin Ore, from Upper Ringarooma.
4. From Mr. James Grant. Specimen resembling fossil wood, from a boring at Tullochgorum, at a depth of from 66ft. to 76ft.
5. From Mr. A. J. Taylor. Model of a Gold Nugget found at Long Plain, West Coast, Tasmania. [In reference to this presentation, the donor has furnished the following note. "The nugget was discovered by a man named Buckner at Long Plain, W. Coast, and weighed a little under 9oz., (avoir.). I have named it the 'Little Welcome,' as it resembles in shape, somewhat, the large 'Welcome' nugget *found at Ballarat*, Victoria, some years back."]

6. From Mr. R. M. Johnston. Specimen of a Cone, probably of a species of Lepidostrobus, from the auriferous sandstones of Campania. [In reference to this presentation, Mr. Johnston read a short descriptive paper.]

To Library—

1. From the Author, Baron von Müeller. "Fragmenta Phytographiæ Australiæ." Vol. II.
2. From Dr. Schomburgk. Report of Progress and Condition of the Botanic Garden and Government Plantations, Adelaide, 1881.
3. From Mr. C. Todd, C.M.G., Government Astronomer, Adelaide. Meteorological Observations made during 1881 at Adelaide.

The CHAIRMAN read an elaborate and interesting paper on the remains of Trilobites from the Mersey River district, and on other fossils from the boulders in the conglomerate beds near Table Cape, with figures and descriptions, communicated to the Society by Robert Etheridge, jun., F.G.S., etc., of the Museum of Natural History, London, and a corresponding Member of this Society.

Mr. STEPHENS said that the specimens which formed the subject of the paper consisted of a collection of Trilobites and other fossils sent to England by himself several years ago, and comprising representatives of all the forms which have yet been discovered in the Silurian rocks of the Mersey district. Mr. Etheridge having very kindly consented to examine and describe them, a large collection of similar specimens was contributed by Mr. Hainsworth, who also furnished several specimens from the boulders near Table Cape. The result is that two entirely new Trilobites belonging to the genera *Conocephalites* and *Dikelocephalus* are described and named by Mr. Etheridge, and six others noticed, which are too imperfect to be described, together with an *Ophileta*, and the internal cast of a bivalve; the fossils identified from the Table Cape conglomerate being a new *Pentamerus*, a *Tentaculites*, an *Orthis*, three species of *Spirifer*, and some doubtful forms. The Trilobite beds might now, in Mr. Etheridge's opinion, be confidently classed as Lower Silurian, and some at least of the Table Cape boulders as Upper Silurian. The arduous nature of the task which Mr. Etheridge had so kindly undertaken might be imagined by anyone who had seen the refractory matrix in which the fossils were found, and he (Mr. Stephens) was sure that a cordial vote of thanks would be unanimously accorded for his valuable paper.

Mr. R. M. JOHNSTON stated that the paper read was one of very great importance, as the determination of the horizon of the Caroline Creek beds at Latrobe, with their included Trilobites, and the fossiliferous conglomerate at Table Cape, will materially help Tasmanian geologists in relating the undetermined ancient rocks which are found largely distributed all along the western part of the island from North to South. Mr. Johnston further pointed out that the Crassatella bed of the Table Cape Tertiary series, which was formerly described by him, rested immediately upon the conglomerates referred to. Much credit was due to Mr. Stephens for the careful selection of fossils made by him in order to have the positions of these important geological horizons truly determined. The members of the Society were under deep obligation to Mr. Stephens, as well as to the able palæontologist, Mr. Etheridge, for this very valuable contribution to the Society's papers

A communication was received from Mr. Aug. Simson, of Launceston, announcing his discovery at "Brady's Look-out," Swansea, of a plant (*Helipterum exiguum*), new to the flora of Tasmania, and its identification by Baron von Müeller.

A special vote of thanks having been unanimously accorded to Mr. Etheridge for his admirable paper, the proceedings closed with the usual acknowledgment to the donors of presentations.

## JULY, 1882.

The monthly evening meeting of the Society was held on Tuesday, 12th July, Mr. C. H. Grant in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for and declared duly elected as Fellows of the Society, viz.:—Mr. William Lees, of the Union Bank; and Mr. C. W. Chapman, of Cascades.

The Hon. Secretary (Mr. Barnard) submitted the following returns for the past month, viz.:—

1. Number of Visitors to Museum—On Sundays 719, on week days 802; total 1,521.
2. Ditto to Gardens—Total 3,722.
3. Plants and seeds received at Botanic Gardens:—From Mr. Barnard, seeds of *Wistaria megasperma*. From the Hon. J. Maclanachan, seeds of a variety of *Cedrus Libani*. From Mr. C. F. Creswell, Melbourne, 14 packets of seeds. From the Botanic Gardens, Melbourne, 30 plants. From Messrs. Heyne and Co., Adelaide, 24 packets of seeds.
4. Plants and seeds sent from Gardens:—To Mr. C. F. Creswell, Melbourne, collection of seeds. To Mr. J. Smith, Riddell's Creek, Victoria a collection of seeds and plants. To Mr. R. J. Lynch, Botanic Gardens, Cambridge, collection of seeds. To Botanic Gardens, Brisbane, Queensland, seeds of Eucalyptus Globulus. To Messrs. Vilmorin, Andrieux, et Cie., France, collection of seeds. To the Chamber of Agriculture, Washington, U.S.A., collection of seeds. To the Royal Gardens, Kew, collection of seeds. To Mr. W. Bull, London, ditto. To Baron von Müeller, Melbourne, ditto. To Messrs. Shepherd and Co., Sydney, collection of seeds and plants. To Mr. J. Latham, collection of seeds. To Dr. James Hector, Wellington, New Zealand, ditto.
5. Books and periodicals received.
6. Presentations to Museum.

*Meteorological Returns*:—

1. Hobart, from Captain Shortt, Government Observer, table for June.
2. Table of Rainfall at various stations in Tasmania, from ditto.
3. Mount Nelson, from the Marine Board, table for June.

The following are the results of observations above referred to:—

*Hobart, June, 1882*:—

Barometer—Mean, 29·776in.

Thermometer.—Means. Max., 58·2deg.; Min., 33deg.; Dry bulb, 45·6deg.; Wet bulb, 43·2deg.

Humidity.—Dew Point Mean, 40·4deg.; Humidity, 823; Elastic force of vapour, 251.

Condensation.—No of days on which rain fell, 13; Amount collected, 2·41in.

Clouds.—Mean daily amount 6 (scale 0·10).

Wind.—Prevailing direction, Westerly; Mean force, 1·5lb. (scale, 0·12).

Remarks.—Rain on 13 days; the heaviest registered was 1·38in., at 9 a.m. on the 20th. Highest temperature in the shade, 58·2deg., on the 28th. The lowest, 33deg., on the nights of the 9th and 15th. On the morning of the 16th, a very heavy fall of snow, from two to three inches deep. Light snow falling at intervals for 30 hours. Before the snowstorm the barometer had been falling slowly and steadily day by day, from the 5th; at 9 a.m. the barometer, then 30·387in., rose a little for 30 hours on the 8th and 9th, then fell slowly to 28·923in., its lowest, on the 15th; with heavy squalls and rain from the westward, lulling early in the morning, when the snow commenced falling heavily. The Comet has been observed a few nights only at Hobart (though seen frequently in the northern part of Tasmania), on account of the cloudy evenings. It showed a well-defined nucleus, and a tail of about 3deg. in length, nearly vertical; visible about N.W. by W., between 5 and 6 p.m. A few days of strong westerly winds, but light winds and calms prevailed during the remainder of the month.

J. Shortt, Government Meteorologist.

*Rainfall in Tasmania, June, 1882* :—

Circular Head, rain fell on 9 days, amount 1·17in.
Oatlands, rain fell on 9 days, amount 1·27in.
On 16th, 7in. of snow.
Falmouth, rain fell on 4 days, amount ·76in.
Mount Bischoff, rain fell on 17 days, amount 5·59in.
On 16th, heavy fall of snow.
Southport, rain fell on 13 days, amount 3·89in.
Low Heads, rain fell on 8 days, amount 1·55in.
Macquarie Harbour, rain fell on 13 days, amount 4·34in.
Botanic Gardens, Hobart, rain fell on 12 days, amount 1·88in.
Hobart City, rain fell on 13 days, amount 2·41in.
Mount Nelson, rain fell on 6 days, amount 1·84in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during June, 1882 :—

15th. Maclaura aurantiaca leaves commencing to fall.
18th. Common Privet ditto.
20th. Calycanthus præcox commencing to flower.
24th. Crocus vernus ditto.
30th. Pyrus japonica commencing to flower.

The presentations to the Museum were as follow :—

1. From Mr. R. C. Weeding, Mount Seymour. A specimen of the Grey Flying Opossum (*Belideus sciureus*), from that locality.
2. From Mr. Thomas Ransom, Fingal. A specimen of the Owlet Nightjar (*Ægotheles Novæ Hollandiæ*).
3. From Mr. A. Dowling, Melton Mowbray. A living specimen of the Chestnut-faced Owl of the colony (*Strix castanops*).
4. From the Hon. the Colonial Secretary. A specimen of the buoyant mattress used in the Italian Navy, with letter from the Italian Consul, Melbourne, on the subject.
5. From Mr. J. E. Baynton. A specimen of the Fan-tailed Cuckoo (*Cacomantis flabelliformis*), shot near Mount Nelson, on July 6. [In reference to the Fan-tailed Cuckoo, Gould states that it "is a migratory species, arriving in Tasmania in September, and, after spending the summer months therein, departing northward in January and February." Its occurrence in the colony in the depth of winter is therefore remarkable.]
6. From Mr. G. Innes. Specimen of Huon Pine (*Dacrydium Franklinii*), and Red Pine (*Athrotaxis selaginoides*), from Macquarie Harbour, in which locality an extensive bed of the latter timber has been discovered.

Mr. Barnard read "Some further Notes on the economic value of the aquatic plant, *Tipha latifolia*," illustrating its utility as a material for stuffing buoyant and life-saving mattresses in the case of shipwrecks and disasters at sea.

Some conversation ensued, and an examination was made of the sample mattress, with a general expression in favour of its introduction into the marine service, its value being recognised from the fact that it was in use in the Italian Navy.

A vote of thanks having been accorded to Mr. Barnard for his paper, and to the donors of presentations, the meeting terminated.

## AUGUST, 1882.

The monthly evening meeting of the Society was held on Monday, August 7, Mr. C. H. Grant in the chair.

The Hon. Secretary (Mr. **Barnard**) brought under notice the following returns, viz.:—

1. Number of visitors to Museum during July. On Sundays, 957 ; on week days, 960 ; total 1,917.
2. Do. to Gardens, do.; total 3,899.
3. Plants and seeds received at Gardens :—From Baron von Müeller, Melbourne, 18 packets seeds. From Mr. C. F. Creswell, Melbourne, 68 packets of seeds indigenous to Australia. From the Horticultural Society's Gardens, Victoria, 44 varieties of fruit scions. From Mr. J. Smith, Riddell's Creek, Victoria, 39 trees. From Messrs. Law, Somner, and Co., Melbourne, 38 varieties of Gladioli.
4. Seeds sent from Gardens. To Botanic Gardens, Calcutta, 36 packets. To do., Saharunpore, 36 do.
5. Books and periodicals received.
6. Presentations to Museum.

*Meteorological Returns* :—

1. Hobart, from Captain Shortt, Government Observer. Table for July.
2. Table of Rainfall at various stations in Tasmania, from do.
3. From the Marine Board. Tables from Goose Island for March, April, and May ; Kent's Group for do.; Bruny Island and Mount Nelson for July.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during July, 1882 :—

14th. Cytysus leucanthus commencing to flower.
18th. Arbutus unedo in flower.
20th. Eranthis hyemalis commencing to flower.
22nd. Garrya elliptica do.
28th. Almond do.
28th. Yellow Crocus do.
30th. White Hyacinth do.
31st. Snowdrop do.

Results of the Hobart observations :—

Barometer.—Mean for month, 29·664in.

Thermometer.—Mean, Max., 50·9deg.; Min., 38·9deg.; Dry Bulb, 44·5deg.; Wet Bulb, 41·7deg.

Humidity.—Dew Point, 38·1deg.; Humidity, 230 ; Elastic Force of Vapour, ·785.

Condensation.—No. of days on which rain fell, 13 ; amount collected, 2·14in.

Clouds.—Mean daily amount, 5·25 (scale, 0·10).

Wind.—Prevailing direction, N.W. and S.W. Mean force, 2·3 (scale, 0·12).

Remarks.—Rain fell on 13 days ; the heaviest fall (5·25in.) was registered at 9 a.m. on the 4th. The highest temperature in the shade was 59deg. on the 2nd ; the lowest, 31deg., on the night of the 29th. There were nine days of strong winds and squally weather from the westward. Snow fell in Hobart on the night of the 13th, the ground and houses being covered in the morning. At 7 a.m. of the 26th another storm of snow, intermingled with rain, passed over the city, continuing all day and through the following night. Very cold weather, with heavy frosts at night continued until the 31st ; the minimum thermometer registering for the nights of Friday the 28th, and Saturday the 29th, at 9 a.m., 32·5 and 31deg. respectively. At Southport, under the thermometer shed the minimum temperature registered was 30deg. on the 28th, and 28deg. on the 29th. The lowest reading of the barometer was 28·964 at 9 a.m. on the 25th, and the highest 30·288in., at 9 a.m. on the 20th. This has been the coldest month experienced for many years, although the mean minimum temperature was higher than that for June. The falls of snow during June and July covered the city to a greater extent than has been previously observed. Mr. W. E. Shoobridge, of Bushy Park, New Norfolk, has kindly furnished the following record of the minimum temperature, at that place, for July, the instrument being under a thermometer shed, viz.—On the 29th, 29deg. ; on the 30th 26deg., the latter being the lowest register for the year.

*Rainfall in Tasmania, July, 1882* :—

Low Heads, rain fell on 15 days, amount 3·99in.
Southport, rain fell on 23 days, amount 4·12in.
Falmouth, rain fell on 9 days, amount 1·21in.
Oatlands, rain fell on 10 days, amount 1·10in.
Mount Bischoff, rain fell on 27 days, amount 11·53in.
Mount Nelson, rain fell on 10 days, amount 1·70in.
Botanical Gardens, Hobart, rain fell on 13 days, amount 1·52in.
Hobart, City, rain fell on 13 days, amount 2·14in.
Circular Head, rain fell on 19 days, amount 5·82in.

J. Shortt, Government Observer.

The presentations to the Museum were as follow :—

1. From Mr. G. Innes. A large specimen of Lignite, from Macquarie Harbour.
2. From Mr. D. Carsons. A Cardinal Finch, from Brazil.
3. From M. Murachi, of the Japanese warship Tsukuba. Three specimens of Japanese money, viz., 10 cents, paper ; 2 ditto, copper ; and 10 ditto, silver.

The Hon. W. A. B. Gellibrand exhibited samples of a Seedling Apple, originally grown at Cleveland, and subsequently worked on stocks at South Arm, which were greatly admired.

Mr. Stephens read the following "Notes on Minimum Temperature at Hobart during the month of July" :—

A question having arisen as to apparent discrepanciec in the records of minimum temperature during the month of July in various parts of Hobart, a few remarks on the subject may not be without interest. On the nights of the 28th and 29th July two unusually severe frosts were experienced. Mr. Leventhorpe Hall reports to *The Mercury* that at 7·45 a.m. on the 29th his thermometer registered 23deg. (Fahr.), and on the following day at 7·30 a.m. 21deg. Comparing notes with the Rev. J. C. Whall, who had also been recording the temperature, he ascertained that the two observations for the night of the 29th July exactly tallied. About the same time it was stated that the minimum results registered by the instruments under the charge of Commander Shortt, R.N., the Government Observer, were 32·5deg. and 31deg. respectively for the two nights in question. A considerable variation may occur at any time in the readings of different instruments, which are not periodically tested by the same standard. Commander Shortt informs me that of two minimum thermometers which have been in use elsewhere in the colony, and which he has compared with the standard, one is 3deg. 5min., and the other 5deg. out. This possible discrepancy must always be taken into account in comparing observations ; but in the present instance the difference is mainly caused by registrations of temperature under widely different conditions of exposure. Mr. Hall's instrument is an ordinary mercurial thermometer, placed outside his house, and unprotected above, but sheltered from the sun. It reads nearly 3deg. lower than the Museum thermometer, and if corrected to that extent, and placed "on grass," the result for the night in question would probably have been much the same as was actually recorded. Mr. Whall's is a self-*registering instrument*, of the type known as Six's Thermometer. It is placed about 18in. from the ground, without protection above or around it, and the general conditions of exposure are nearly equal to those under which the temperature "on grass" is usually ascertained. On the other hand, there is no thermometer in use at the Barracks at present for recording the temperature "on grass," nor is there any place available for the purpose. The maximum and minimum thermometers are intended to record the temperature of the air under definite conditions of protection, and are kept, as nearly as present circumstances allow, under the conditions prescribed for all the meteorological stations in the intercolonial system. They are new instruments by Negretti and Zambra, and as they were obtained from Mr. Ellery, it is superfluous to say that they supply a better standard than is obtainable elsewhere in the colony. Their position, pending the completion of the instrument shed, is of course not satisfactory, and they will probably register both a higher and lower temperature when placed under it than they do now; but it must be remembered that the temperature of the air, as taken at a meteorological station, is a very different thing from the temperature "on grass." My own observations have necessarily been so irregular that they are of little value; but I believe that the lowest temperature yet noted in the colony was registered by a thermometer which I placed on the top of Mount Wellington several years ago, and which gave 16deg. as the minimum temperature for two consecutive winters. The minimum "on grass" in Hobart during the same period was 24deg.; but, for the present exceptional season, a record of 21deg., as the minimum temperature, is probably not far from the mark. But no meteorological statistics can be satisfactorily registered at Hobart until the station is properly equipped, and favourable conditions of observation permanently and effectually secured. Since writing the above I find that Mr. Shoobridge records as the minimum temperature of the air at New Norfolk, on the night of the 28th July, 29deg.; and on the following night 26deg.; a result which, if I may judge from experience of the winter temperature at the two places, agrees pretty closely with that obtained at the temporary station in the Barracks.

On the conclusion of the reading of the paper, Mr. Grant observed that Commander Shortt must have chosen an unfortunate position for his thermometer, the day temperature throughout the whole of the 30th July having certainly been below the freezing point, as proved by the frozen condition of the ground, and the forming of ice on tubs placed 4ft. above it, where sheltered from the direct solar rays. Such temperature, therefore, would probably have been much lower during the preceding night, and was proved to be so by the observations of Messrs. Hall and Whall. He understood that Captain Shortt's thermometer was placed under a deep verandah, and a worse place than an ordinary verandah could scarcely be selected for observing the air temperature. The usual position for this instrument is at the back of a light screen of trellis work or louvre painted white, and with a top covering which protects it from the direct sunlight, but allows the free circulation of the air around, and it should be at such a distance from every other object as not to receive heat therefrom. Under a verandah the temperature of the partially stagnant air, increased by the heat radiation of all surrounding objects, especially of the house, would alone be obtained, and doubtless differ many degrees from the true air temperature correctly taken. In a long course of practical experiments and observations he had not found much difference in the minimum readings were the thermometer placed only 9in., or several feet above the ground, whether covered or uncovered, if the roof were simply a shade; but there was a considerable difference on a clear night between the readings of an instrument placed on the grass, or not more than 3in. above it, of a wet bulb, and of a dry bulb thermometer; the wet bulb reading showing an intermediate temperature between the other two. *He did not think that* in Hobart the extreme difference would much exceed 4½deg., because there is rarely an entire absence of cloud, which checks the radiation and evaporation, but in some of the high table lands of India, the Deccan especially, where the air is of less density and the skies perfectly clear, the difference between an air and grass thermometer sometimes exceeds 10deg. The readings from a Six's Thermometer could not be so fully relied upon as the simple form, as, although very convenient for reference, their liability to derangement made them almost a toy. There was little trouble with spirit thermometers, if attention were paid them to see that the spirit was all connected with that in the bulb, but it must not be expected that any two thermometers will read exactly together throughout the scale, even though all were divided on the glass, from very carefully ascertained points, and from comparison with undoubted standards, as were the best instruments. Still, the registered maxima and minima of all good thermometers, placed in similar positions, should coincide.

Mr. Stephens thought that Mr. Grant had somewhat misunderstood his remarks, and described the conditions under which the temperature of the air would be registered, when the arrangements are completed, by thermometers placed close under a double roof, and 4ft. or 5ft. from the ground. Of course the temperature registered by thermometers freely exposed would depend on whether they were placed close to the ground or at a considerable distance above it. The thermometers at the Barracks appeared to have been put in the verandah because there was no other covered place available for them.

Mr. R. M. Johnston said he agreed with the remarks made by Mr Stephens. He was aware that arrangements for reading the temperature were not yet made, and it was therefore not fair to say that Commander Shortt's readings were incorrect, for he was necessarily more conversant with meteorology than the gentlemen who had published the records of their thermometers. Commander Shortt had, moreover, followed the system laid down for taking such records, whereas the other records mentioned had all been taken at different times and under different conditions. He considered that Commander Shortt, as far as his present arrangements would allow, had taken his records under precisely the same conditions as were adopted in every part of the world, and that the other gentlemen were necessarily incorrect, having conformed to no rules whatever in placing their instruments. He hoped that in a short time Commander Shortt would be able to take records under all conditions, and then his readings would compare with the thermometers of others.

Mr. H. J. Buckland understood that Commander Shortt's thermometer was placed against the wall of his house, and thought that would to some extent affect the reading; it would draw heat from the interior of the house and surrounding objects. He doubted if readings in other parts of the world were taken under such conditions, as if so, it would be impossible to arrive at the true climate of a country. If by this means the temperature of what was admitted to be a bitterly cold night was only shown as 32deg., and by other instruments without cover it was said to be 20deg., it was surely impossible to arrive at a correct temperature of the locality.

Mr. Johnston explained that the reason for using a cover was to exclude the direct influence of sunlight, and everything was eliminated that could, in the least degree, influence the temperature, and therefore scientific men have advised that there should be some standard of eliminating all disturbing influences, and Commander Shortt, as far as he could, had adopted these principles, and if all these conditions were taken into consideration, there would not be such a great discrepancy in the readings as now appeared.

Mr. Riddoch thought Commander Shortt's readings deceptive in *stating the temperature* of the atmosphere. He had seen where

Commander Shortt's instruments were placed, and did not think they could ever give the normal state of the air. The verandah had a roof, and was enclosed on both sides. The instruments were against a weatherboard wall, and sheltered from the west and south-west; and altogether a more sheltered place could hardly be found, and the lowest temperature could not possibly be obtained.

Mr. JOHNSTON then read an elaborate and valuable paper, entitled ' General and Critical Observations on the Fishes of Tasmania, with a Classified Catalogue of all the known species." The time was too limited to admit of more than the first two divisions of the subject being read, and the remainder, including the classified catalogue, was deferred until the next monthly meeting. Discussion on the portion read was also deferred until a future occasion, in order to admit of its being printed and circulated.

The usual vote of thanks was accorded to the contributors to the Museum, and also to the authors of the papers read.

## SEPTEMBER, 1882.

The monthly meeting of the Society was held on Monday, the 11th September; Mr. T. Stephens, V.P., in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for, and declared duly elected as honorary Members of the Society, viz.:—Baron Ferd. von Müeller, K.C M.G., M.D., F.R.S., Government Botanist of Victoria; and the Rev. J. E. Tenison-Woods, F.L.S., F.G.S., F.R.G.S., etc., etc.

The Hon. Secretary (Mr. BARNARD) laid before the meeting the following returns for the month of August:—

1. Number of visitors to Museum—On Sundays, 1,012; on week days, 666; total, 1,678.
2. Do. to Gardens—Total, 4,192.
3. Plants received at Gardens: —From Messrs. Shepherd and Co., Sydney, 16 plants. From Messrs. Vilmorin and Co., Paris, a general collection of flower and shrub seeds. From Mr. W. R. Guilfoyle, Director of Botanic Gardens, Melbourne, seeds of Pinus Australis (the Georgia Pitch pine). From Professor McOwen, Cape Town Botanic Gardens, sods of Disa grandiflora, a magnificent Orchid from the Table Mountain, in good condition.
4. Books and periodicals received.
5. Presentations to Museum.

***Meteorological Returns.***

1. Hobart, from Captain Shortt. Table of observations for August. Registers of rainfall at various stations through the colony.
2. From the Marine Board. Monthly tables from Mount Nelson for August; Swan Island for May; Goose Island for June and July; and King's Island from February to July inclusive.

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during August:—

20th. Sambucus niger commencing to break.
24th. Horsechestnuts do.
28th. Gooseberries do.
28th. Elm commencing to flower.
29th. Poplar commencing to break.
30th. Apricots commencing to flower.

Results of the Hobart observations:—

Barometer.—Mean *for month*, *29·836*in.

Thermometer.—Mean, Max., 52·2 deg.; Min., 40·7deg.; Dry Bulb, 48·1deg Wet Bulb, 45·6deg.

Humidity.—Dew Point, 42·9deg.; Elastic Force of Vapour, ·276; Humidity, ·821.

Condensation.—Number of days on which rain fell, 12; amount collected, 4·82in.

Clouds.—Mean daily amount, 6 (scale 0-10).

Wind.—Prevailing direction, South and N.W. Mean force, 1·4 (scale, 0-12).

Remarks.—Rain on 12 days. The heaviest fall, registered at 9 a.m. on the 9th, was 1·48in. Highest temperature in the shade, 60·8deg. on the 25th; the lowest, 33·6deg., on the night of the 10th. Light and variable winds prevailed during the month, with a few squally days. Thick fogs at beginning of month. Heavy rain during the first eight days, 4½in. having fallen in that time. Cloudy and damp throughout the month. The lowest reading of the Barometer, 29·233in., was at 3 p.m. of the 31st; and the highest, 30·209in., at 9 a.m. of the 27th.

A very large and brilliant meteor was observed at 7h. 10m. p.m. on the 5th.

*Rainfall in Tasmania, August, 1882* :—

Hobart, rain fell on 12 days, amount 4·82in.
Southport, rain fell on 14 days, amount 3·23in.
Oatlands, rain fell on 15 days, amount 2·47in.
Falmouth, rain fell on 17 days, amount 4·91in.
Low Heads, rain fell on 18 days, amount 4·13in.
Circular Head, rain fell on 23 days, amount 4·12in.
Mount Bischoff, rain fell on 23 days, amount 4·52in.
Botanical Gardens, Hobart, rain fell on 14 days, amount 3·09in.
Strahan, Macquarie Harbour, rain fell on 26 days in July; amount collected, 6·62in.

*Presentations to Museum* :—

1. From Mr. A. Winter. Specimens of an albino variety of the Brush Kangaroo (*Halmaturus Bennettii*), mounted.
2. From Mr. W. Ritchie. Specimen of Asbestos, from Anderson's Creek.
3. From Mr. J. Simmons. Specimen of Lode Tin from the claim of the Lottah T.M. Co., Gould's Country.
4. From Mr. Lester. Specimen of Ruby Tin from the vicinity of the Heemskirk River.

In reference to the specimens of asbestos from the West Tamar, which were exhibited at the meeting, the CHAIRMAN remarked that it was to be regretted that this mineral had hitherto received little attention, though it had long been known to exist in the colony; indeed, the Asbestos Ranges derived their name from it in very early days, though, as Mr. Gould had pointed out, they were quite unconnected with the serpentine of the neighbourhood of Anderson's Creek, in which rock it occurs. There was one point in connection with this substance which was involved in some obscurity. The mineral known to manufacturers in the United States and elsewhere, and now largely used for sheathing boilers and steam pipes, for packing piston rods, and for general felting purposes, is the true asbestos classed by Von Cotta, Dana, and other mineralogists, among the anhydrous silicates of lime and magnesia, and is a fibrous variety of tremolite, or actinolite. The proper title of the West Tamar mineral is probably chrysotile, better known as picrolite, or Schiller asbestos, a fibrous variety of serpentine, which belongs to the hydrous silicates of magnesia. As far as one could judge from superficial examination, the fibre seemed to be of excellent quality, and it would be interesting to ascertain whether it is inferior in any essential point to the other asbestos, *so far as regards the* special purpose for which it is manufactured.

Mr. C. H. GRANT observed that there were many reasons why the article had not yet been exported in large quantities for manufacturing purposes. Asbestos was found in considerable abundance in many parts of the world, especially in Cornwall, Corsica, and the Austrian Alps; but the largest deposits he knew were situated near the banks of the St. Lawrence, and in the United States: there the fibres were of great length. He had not heard of two qualities, differing in chemical composition, being used in manufacture, but there were many varieties from the desiccated fibre of amianthus to the massive rock, and these necessarily differed to some extent in their chemical composition. The specimen on the table appeared similar to other deposits that he had seen, but not so white and silky as that from Cornwall and Hungary. Some very fine samples had been procured in Virginia, U.S. He understood that the mineral was found in large quantities on the West Tamar in veins 2ft. thick and upwards, of considerable length. That so obtained appeared to be a good merchantable article, as far as he could judge, comparing it with what he had previously seen. The bulk of the asbestos that had come under his notice was of much shorter fibre than in the samples on the table, it being arranged vertically in slabs of from half an inch to one inch in thickness, but he had been informed that fibres of only half an inch in length could now be worked into many useful products. It should be remembered that Tasmania is a long distance from the centres of manufacture, as compared with other localities where this mineral is found, and whence it could be obtained at a low price. It had only recently become in important demand, but now that it is coming into such general use there is a probability that a large market will be found for the Tasmanian article.

Mr. R. M. JOHNSTON said that he had found a variety of fibre and colour in asbestos according to its exposure to atmospheric influences. It was only possible to get the fibre, in its true state, in the solid rock. Mr. Davies, an authority on the subject, states that asbestos is only just coming into general use, and is found very useful for packing engine piston rods, etc., but dependent upon the length of fibre to be of value. All the Tasmanian asbestos that he had seen had very short fibre.

Mr. R. M. JOHNSTON read the second part of his paper on the Fishes of Tasmania, which will be concluded at the next evening meeting of the Society.

The CHAIRMAN said that at the last meeting of the Society mention was inadvertently omitted of a new addition to the *fauna* of Tasmania in the shape of two native rats—one constituting a new genus—which are described by Mr. Oldfield Thomas, F.Z.S., of the British Museum, in the "Annals of Natural History" for June, 1882. One was described from a specimen sent to the British Museum by the late Mr. Ronald Gunn, the other from specimens contributed by Mr. Augustus Simson. A paper on this branch of the Tasmanian *fauna* had been communicated by Mr. Petterd, and would probably have been read that evening, had time allowed.

Mr. JOHN SWAN remarked that about two years ago he obtained a specimen of a black rat, generally considered as a Tasmanian species, but, on reference to Gould's work, he found it to agree with the description of one previously known to exist in Western Australia, and not mentioned as occurring in Tasmania. He did not agree with the idea that rats of different colours could not belong to the same species, for he had observed two of these animals, which had their nest near his residence, one of them being similar to the one above referred to, and the other of a much lighter colour. When at Deloraine a short time since, he saw a black rat killed, the colour of which induced no remark, being evidently regarded as nothing unusual.

A short discussion ensued, after which the usual vote of thanks was passed to the several donors to the Museum, and also to Mr. Johnston for his interesting paper.

## OCTOBER, 1882.

The usual monthly evening meeting of the Society was held on Monday, 9th October; Mr. Justin McC. Browne in the chair.

Mr. H. W. D. Archer, M.H.A., of Brickendon, who had previously been nominated by the Council, was balloted for and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following returns for the month of September, viz.:—

1. Number of visitors to Museum—on Sundays, 742; on week days, 1,000; total 1,742.
2. Do. to Gardens—Total 4,603.
3. Books and periodicals received.
4. Presentations to Museum.

*Meteorological Returns*:—

1. Hobart, from Captain Shortt, Government Observer. Table of observations for September. Registers of rainfall at the various stations in the colony.
2. From the Marine Board. Tables from Mount Nelson and South Bruny Lighthouse for September.
3. From the Government Observer, Wellington, New Zealand. Printed tables for May, June, and July, 1882.

Results of the Hobart observations for September:—

Barometer.—Mean for month, 29·428in.

Thermometer.—Means: Max., 67·2; Min., 37·2; Dry Bulb, 52·4; Wet Bulb, 48·5.

Humidity.—Dew Point, 44·8; Elastic Force of Vapour, 29·7; Humidity, 75·4.

Condensation.—Number of days on which rain fell, 18; amount collected 2·93in.

Clouds.—Mean daily amount, 6·6 (scale 0·10).

Wind.—Prevailing direction, N.W.; mean force, 3·4 (scale 0·12).

Remarks.—Rain fell on 18 days; the heaviest fall, 0·51in., was registered at 9 a.m. on the 30th; showery weather throughout the month. The highest temperature in the shade was 67·2, on the 21st; the lowest 37·2, on the night of the 14th. Gales and strong squally winds from N.W. prevailed through the month. On the morning of the 13th snow was well down on the hills, and in the forenoon large flakes fell in the town. Snow fell heavily at Oatlands. The Comet has been frequently observed in the morning; it now rises earlier, and to the Southward of East, travelling to the Northward. The tail is extended to a greater degree than when first seen, and the nucleus is more brilliant.

*Rainfall in Tasmania, September*, 1882:—

Hobart, rain fell on 18 days, amount 2·93in.
Do. Botanic Gardens, rain fell on 18 days, amount 2·45in.
Southport, rain fell on 21 days, amount 5·37in.
Oatlands, rain fell on 17 days, amount 1·69in.
Falmouth, rain fell on 9 days, amount 1·26in.
Low Heads, rain fell on 18 days, amount 3·04in.
Circular Head, rain fell on 23 days, amount 4·54in.
Mount Bischoff, rain fell on 29 days, amount 14·30in.
New Norfolk, amount 3·82in.
Fingal, rain fell on 8 days, amount 1·83in.
Mount Nelson, rain fell on 11 days, amount 1·75in.
Macquarie Harbour, rain fell on 5 days, amount 1·81in.

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during September, 1882:—

20th. Horsechestnut commencing to flower.
*22nd. Mountain* Peony do.

28th. Ash commencing to break.
29th. Grape vines do.
29th. Sycamore do.
30th. Robinia pseudo Acacia do.

The presentations to the Museum were as follow:—

1. From Mr. S. H. Wintle. A collection of Fossils from the Rock House estate, St. Paul's River.
2. From Mr. A. J. Taylor. Specimens of Garnet from Mount Heemskirk.
3. From Mr. Schofield. An Egg, probably of a species of Petrel, embedded in Guano, from Bird Island.
4. From Mr. Moore. Specimen of Aragonite from a cutting through greenstone at Elboden-place, Hobart.
5. From Mr. J. R. McClymont. 18 silver and 32 copper coins.
6. From Mr. James E. Salier. Jaws of a large Shark.
7. From Mr. D. Carson. A "Bleeding Heart" Dove (*Phlogœnas cruenta*).

The following papers were read:—

1. "Description of some New Marine Shells of Tasmania." By Lieut. C. E. Beddome, I.N.
2. "Notes on two species of rather rare Fish recently captured in the Derwent; viz., *Clinus despicillatus* a species of the Blenny family, and *Bovichthys variegatus*." By R. M. Johnston, F.L.S.
3. "Descriptions of hitherto undescribed Antechini and Muridæ inhabiting Tasmania." By Mr. E. T Higgins, M.R.C.S. Eng.; and Mr. W. F. Petterd, C.M.Z.S.

The proceedings closed with a vote of thanks to the authors of the papers read, and to the donors of presentations.

## NOVEMBER, 1882.

The usual monthly evening meeting of the Society was held on Tuesday, 14th November; Mr. T. Stephens, V.P., in the chair.

Mr. Wyatt Hickling, who had previously been nominated by the Council, was balloted for and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following returns for the past month; viz.:—

1. Number of visitors to Museum—On Sundays, 1,217; on week days, 794; total, 2,011.
2. Number of visitors to Botanic Gardens—Total, 5,600.
3. Seeds received at Gardens.
4. Books and periodicals received.
5. Presentations to Museum.

*Meteorology*:—

1. From Captain Shortt, Government Observer. Abstract table of observations taken at Hobart for October. Table of rainfall at various stations in the colony during October.
2. From the Marine Board. Tables from King's Island for August, September, and October; Swan Island for June, July, and August; Goose Island for August, September, and October; Kent's Group for July, August, and September; Mount Nelson and South Bruny for October.

The following are the results of the Hobart observations for October:—

Barometer.—Mean, 29·718 inches.

Thermometer.—Means: Max., 72; Min., 37·5; Dry Bulb, 55·5; Wet Bulb, 51·1.

Humidity.—Dew Point: Mean, 47; Elastic Force of Vapour, ·323; Humidity, ·922.

Condensation.—Number of days on which rain fell, 13; amount collected, 3·79 inches.

Clouds.—Mean daily amount, 6 (scale 0-10).

Wind.—Mean force, 2·5 (scale 0-12); prevailing direction, N.W. and S.E.

Remarks.—Rain fell on 13 days; the heaviest fall, 1·45in., was registered at 9 a.m. on the 20th. The highest temperature in the shade was 72 on the 18th; the lowest 37·5, on the nights of the 21st and 27th. The lowest reading of the barometer was 29·207in., at 3 p.m. on the 1st; the highest 30·139in., at 9 p.m. on the 27th. Strong winds from W. and N.W. on the 6th and 10th. The Comet is becoming much fainter. The planet Venus has been frequently visible to the naked eye, in daylight, during the month. A very heavy fall of snow occurred at Oatlands on Thursday, the 17th, covering the ground, in some places, to a depth of seven inches.

*Rainfall in Tasmania during October, 1882*:—

Hobart, rain fell on 13 days, amount 3·79in.
Southport, rain fell on 12 days, amount 3·50in.
Low Heads rain fell on 12 days, amount 1·31in.
Botanic Gardens, Hobart, rain fell on 12 days, amount 3·16in.
Oatlands, rain fell on 15 days, amount 1·95in.
Falmouth, rain fell on 7 days, amount 1·68in.
Circular Head, rain fell on 12 days, amount 2·56in.
Mount Bischoff, rain fell on 21 days, amount 6·27in.
Fingal, rain fell on 7 days, amount 1·39in.
Waratah and Macquarie Harbour for September, rain fell on 24 days, amount 8·63in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during October, 1882:—

5th. Carpinus betulus commencing to break.
14th. Ailanthus glandulosus ditto.
15th. Morus niger ditto.
16th. Common Lime ditto.
18th. Elm ditto.
20th. Melia azederach ditto.

Presentations to Museum:—

1. From Mr. William Knight, M.A. 12 coins, viz.: 1 franc piece (silver), French Republic, 1851; three half, and three quarter annas (copper), India, 1835; one ditto, 1858; three ditto, 1862; one 5-cents, Ceylon, 1870.
2. From Mr. G. Dinham. Portion of cloth unrolled from the mummy of an Egyptian priest.
3. From Mr. A. S. Raiker, Campbell Town. A copy of the *Mercurius Caledonicus*, the first newspaper printed in Scotland, dated 1661. A silver egg-cup and spoon, a silver teaspoon, and pair of sugar tongs, formerly the property of an officer on board Captain Cook's ship when on the voyage round the world.
4. From Mr. E. D. Swan. 140 specimens of shells, 5 ditto of birds, mounted, and a collection of insects, from Fiji; 25 specimens of shells and a lizard (*Pygopus lepidopus*) from New South Wales; and 8 Tasmanian birds, mounted.

[The SECRETARY drew special attention to this valuable collection of objects of natural history from Fiji and New South Wales, presented by Mr. E. D. Swan, and observed that that gentleman set an admirable example to Fellows of the Royal Society, when visiting foreign countries, not to forget the Society when opportunities offered, for adding to the contents of the Museum, and thus helping to make it more and more attractive, to the youth of the colony especially, in an educational point of view.]

The attention of the meeting was directed to a magnificent specimen of topaz, discovered by Mr. S. H. Wintle on the claim of the North Mount Cameron Tin-mining Company, and kindly forwarded by him to the Museum for exhibition. This specimen weighs 4lb., is of a pale blue colour, very transparent, apparently without flaw, and shows the form of crystallisation very perfectly.

The CHAIRMAN read a letter which he had received from Mr. Ward, Government Analyst, who, he said, had kindly undertaken to examine the West Tamar Asbestos, and to compare it with the manufactured product which had been exhibited in the shape of a specimen of packing for steam joints The results of analysis are as follow :—

(A)

| | West Tamar Asbestos. | "Packing." |
|---|---|---|
| Silica | 41·80 | 38·88 |
| Magnesia | 36·22 | 31·68 |
| Iron Protoxide | 8·28 | 6·84 |
| Water lost at 212 F. | 1·00 | — |
| Do. lost at red heat | 12·70 | 22·60 |
| Lime | none | traces |
| | 100·00 | 100·00 |

(B)

Results calculated minus loss on ignition :—

| | West Tamar Asbestos. | "Packing." |
|---|---|---|
| Silica | 48·43 | 50·23 |
| Magnesia | 41·97 | 40·93 |
| Iron Protoxide | 9·60 | 8·84 |

In reference to (B), Mr. Ward says :—"I have also calculated them out minus the total loss on ignition, thus getting a much fairer comparison, as the 'packing' contained oil as well as water. The results show that, so far as chemical composition goes, there is nothing against the use of the Tasmanian mineral for similar purposes. The composition in each case closely resembles that of some varieties of serpentine, and not that of hornblende.

Mr. R. M. JOHNSTON, F.L.S., read a description of a new species of Fish (*Lophotes Guntheri*), caught near Emu Bay, Tasmania.

Mr. JOHNSTON then read the concluding portion of his paper on the Fishes of Tasmania, which had been held over from a former meeting.

The SECRETARY referred to the elaborate and exhaustive paper on the Fishes of Tasmania which had just been concluded by Mr. Johnston, and regretted the absence of several members who had been present at the previous meetings when the two former parts had been read, and who, it was anticipated, would have joined in the discussion upon the whole subject when completed. It had been hoped also that the paper might have been printed in the interim, to facilitate the discussion. Mr. Barnard added, that the Society, as well as the colony, are highly indebted to Mr. Johnston for his valuable contribution to this important division of natural history, as, to his own personal knowledge, the publication in the "Tasmanian Journal of Science," some forty years back, of an article by Dr. Richardson, on the Fishes of Port Arthur, was followed up by an earnest application from the writer to the then Lieut.-Governor, Sir John Franklin, to procure and send home specimens of all new varieties of fish that could be procured from our waters ; and ever since a more comprehensive account of our Fishes has been deemed a *desideratum*. This has now been accomplished by Mr. Johnston, who enumerates 190 *species of Fish as known* to Tasmania. Mr. Barnard then referred to the economic uses of the fish which abound on our coasts, and that this catalogue, in pointing out the best species for the purpose of being cured and exported, will prove a most useful guide in promoting trade and foreign commerce; and he concluded by moving the thanks of the Society to Mr. R. M. Johnston for his valuable papers, to Mr. W. F. Ward for his analyses of the specimens of Asbestos, and also to the various donors of contributions to the Museum during the past month.

Mr. NAPIER remarked that many years ago a large trade was done by some Chinese in the treatment of fish for exportation.

The vote of thanks, moved by Mr. BARNARD and seconded by Dr. E. J. CROUCH, was then put to the meeting and carried unanimously.

Mr. JOHNSTON, in acknowledging the vote of thanks, spoke of the labours of those who had preceded him in the same path, and especially mentioned the late lamented Mr. Morton Allport as having contributed largely to the Ichthyology of Tasmania; and he then drew the attention of the meeting to some exquisite drawings of certain Fishes, by Mr. H. J. Graham, which he had brought down for exhibition.

The meeting, which is the last for the session of 1882, then closed.

ON

# THE FISHES OF TASMANIA;

WITH A

## Classified Catalogue of all the known Species.

BY ROBERT M. JOHNSTON, F.L.S.,

Fellow of the Royal Society of Tasmania and of the Linnean Society of New South Wales, &c.

[*Read 7th August*, 1882.]

# GENERAL AND CRITICAL OBSERVATIONS ON THE FISHES OF TASMANIA.

In submitting to the Fellows of this Society my observations upon the Fishes of Tasmania, I am especially reminded of the valuable labours of the late Mr. Morton Allport in this direction, and of the loss which Ichthyology has sustained by his untimely death. Not only had he laboured zealously and successfully in all matters relating to the acclimatisation of the European *Salmonidæ* and other fishes, but, in addition, he had at much pains during a number of years collected many of our indigenous fishes and forwarded them to Dr. Günther, of the British Museum, with his observations. A few of those forwarded by him were afterwards described by Dr. Günther as new to science, and a still larger number, although already known and described, were reported for the first time to include Tasmania in their distribution. In this way he materially extended our knowledge of the indigenous fishes, and so increased the known list from about 100 to 142 species. These were recorded by him in a MS. Catalogue, which the Council of this Society kindly placed at my disposal when they learned that I was independently engaged on a similar work. Unfortunately with respect to this Catalogue, there are no notes or observations of any kind regarding the fishes themselves; and if no other records exist, the greater part of the knowledge which he gained by his many years of patient study has been lost to science.

It is right that I should here also mention how much we are indebted to Mr. T. J. Lempriere, who was the first Tasmanian naturalist who formed an extensive collection of fishes. His collection was described by Dr. Richardson, and afterwards published in the Journal of the Zoological Society in the year 1839, and reprinted in the Tasmanian Journal, vol. I, p. 59-65 ; 99–108.

My own labours in connection with the fishes of Tasmania only extend over the last six years, but during that period I have devoted much of my time to their investigation. The branch of study which especially occupied my mind has been one that had already engaged my attention in respect of the land *and fresh-water* shells of this Island,—viz., *habits and variability.* Like some species of our land shells, many of our fishes have been described from single specimens, or from individuals sent to Europe at various times more or less imperfectly preserved. The difficulties of dealing with the classification of certain species are great enough when the specimens available are abundant and perfect, but they are increased tenfold when the only specimens available for examination are both imperfect and few in number. The limits of variability must first be accurately determined before a satisfactory classification can be established in respect of closely allied species. It is not expected that the vexed subject of "what is a species" and "what is a variety" can be settled by the references made in this paper in respect of some of our fishes about which there is some doubt; but it is hoped that the observations carefully recorded by me may be helpful at least in basing the classification of some of our local species upon a wider and more secure foundation. As such, these observations are respectfully submitted for the consideration of those eminent in the science.

Of the 188 species known to exist in Tasmanian waters I have personally examined the general characters of about 145 species. Indeed, I have been in the habit of making drawings and recording particulars of all individual fishes which came into my possession, whether rare or common. Of the more common fishes I have recorded characteristic particulars of several hundred distinct individuals. I mention this for the purpose of showing that the opinions herein advanced by me in respect of matters related to classification are based upon the observations of many individuals of the same species taken in different seasons and in various stages of development. It is in this place also desirable to state that as a Member of the Royal Fisheries Commission, which has now almost completed its enquiries into all matters relating to Tasmanian Fish and Fisheries, I have been enabled to verify many observations of which I was formerly doubtful, and to extend my information with respect to the habits of the more common market fishes, and to matters relating to the fishing industry of this Island generally.

The great portion of our fishes were described from specimens collected by various naturalists who accompanied expeditions from Europe between the years 1834 and 1842.

The following are the names of authors who have determined the greater number of species known to exist in Tasmanian waters:—

| | | |
|---|---|---|
| Dr. Richardson | 41 | species. |
| Dr. Günther | 32 | ditto. |
| Cuvier & Val. | 21 | ditto. |
| Linnæus | 17 | ditto. |
| Castelnau | 10 | ditto. |
| Johnston | 10 | ditto. |
| Various authors (25) | 57 | ditto. |
| TOTAL | 188 | |

In the Catalogue which follows the General Observations I have given reference specially to three distinct sources as regards fuller specific description or as an authority for the existence of the particular species in Tasmanian waters. These are—

1. Dr. Günther's Catalogue of Fishes, 8 vols., London, 1859-70.
2. Mr. Macleay's Descriptive Catalogue of the Fishes of Australia. Pros. Linn. Soc. New South Wales, vols. 5 and 6, 1881.
3. Mr. Morton Allport's MS. List of Tasmanian Fishes.

With respect to the last reference, I have to explain that although it consists of a mere list of names, it is a guarantee of the existence of the species in Tasmania, and it affords me the extreme gratification of having Mr. Allport's name associated with my own in the first attempt to give a systematic review of our Tasmanian Fishes.

That there are many imperfections may be expected, but I have endeavoured to make the list as complete as possible. Mr. Macleay's very useful Catalogue, to which I have referred, is very complete, and those who wish to study the Fishes of Australia will find it to be indispensable.

The following Chapters contain—

1st. A brief description of our Market Fish and Fisheries.
2nd. Observations upon the Freshwater Fishes, including a chapter on the Introduced Species.
3rd. Observations upon the Marine Fishes, in the order of the Families as arranged by Dr. Günther.
4th. A Classified Catalogue of all the known Species, with references to the sources where they are more fully described, and, in some cases, with critical notes and observations.

## Market Fish and Fisheries.

With a population of only 120,000 persons, it cannot be expected that the fishing industry in Tasmania can be very extensive; nevertheless it is estimated that there are about 1050 persons directly dependent upon the capture and sale of Fishes.

Hobart is the chief centre of the industry, its position being particularly favourable in this respect from its nearness to the principal fishing-grounds. Fully 63 per cent. of the men and boats belong to Hobart; and the men carry on their business either in the upper or lower waters of the Derwent, or in the open sea Trumpeter reefs, 40 to 80 fathoms, lying between Seymour on the East Coast and Port Davey on the South-West. The marine fishing-grounds may generally be divided into three classes:—

I. The "Home Grounds," near shore or in the upper shallows of estuaries, where the seine-net is largely used in the capture of—

| | |
|---|---|
| The Sole .. .. | *Amnotretis rostratus.* |
| The Flounder .. | *Rhombsolea monopus.* |
| Garfish ........ | *Hemirhamphus intermedius.* |
| Mullet ........ | *Agonostoma Forsteri.* |

In the Derwent, Tamar, Port Sorell, and George's Bay especially, there are many fishing-grounds where these fish are to be found in considerable numbers. Unfortunately, the flat fishes of Tasmania, and the Garfish, can only be captured by means of the seine-net, which in its operations destroys in myriads the young of all the fishes which tend to seek such shallow ground for food and shelter. Many unprotected localities, such as Ralph's Bay, in the Derwent, where such fish were once so abundant, have now been rendered almost barren from the indiscriminate and continuous operation of the destructive seine-net. The effect of the seine-net is clearly shown in the Derwent. The upper portion of the river, prior to being closed for the protection of the Salmonidæ, was so much thinned out by continuous and destructive seining, that the rod fishermen interested in the capture of mullet, native salmon, perch, &c. could no longer find it profitable to fish in this locality. Since this portion was so protected, all kinds of estuary fish have become so abundant, that it is stated that more mullet are caught now in these waters by amateur rod fishermen than were taken formerly by the seine-net.

The problem of devising some means whereby the *Flounder*, *Garfish*, and other useful marketable fish, might be secured without involving the destruction of countless numbers of the ova and young of these and other fish, has yet to be solved. Certainly, limiting the size of the mesh of the seine might do some good, but it has been shown that the mesh which would allow the escape of the young Mullet, Perch, and Bastard Trumpeter, would still destroy the young of the Flounder. It is also shown that, owing to the mode in which the seine is used, the scraping of the lead-rope, and the enclosed weed render it almost impossible for the young fish to escape when the net is drawn upon the beach, even though the mesh of the seine were considerably enlarged. It seems, therefore, that the only way to remedy the evil is to reserve certain suitable areas in our estuaries as nursery grounds, wherein the use of the seine-net should be absolutely prohibited. The New South Wales Government have been obliged to adopt this course in respect of certain lakes and estuaries, in the interest of the deep-sea market fish, whose wholesale destruction was threatened by the operation of the seine-net.

II. The "MiddleGround" Fisheries are generally situated towards the mouth of estuaries, or in certain sheltered bays where the depth of water is from 5 to 6 fathoms. In such localities the graball net and ordinary hook and line are employed principally, in the capture of the following market fish :—

| | |
|---|---|
| The Native Salmon | *Arripis salar.* |
| The Bastard Trumpeter | *Latris Forsteri.* |
| The Black and Silver Perch | *Chilodactylus macropterus.* |
| The Magpie Perch | *Chilodactylus gibbosus.* |
| The Carp | *Chilodactylus Allporti.* |
| The Flathead | *Platycephalus bassensis.* |
| The Silver Trevally | *Caranx Georgianus.* |
| The Snotgall Trevally | *Neptonemus brama.* |
| The Rock Cod | *Pseudophycis barbatus.* |
| The Ling | *Genypterus blacodes.* |
| The Sand Mullet | *Mugil dobula.* |
| The Conger Eel | *Conger vulgaris.* |

III. The "Outer," or "Open Sea" fishing-grounds, lie principally in the Southern waters of Tasmania, from one to sixteen miles off the coast, in depth of water ranging from 20 to 80 fathoms.

The fishing-boats employed in these grounds are necessarily the best of their description, although the most of them are open whale-boats, fitted, as nearly all of our Hobart fishing-boats are, with wells for keeping the fish alive *after capture.*

The fish, bottom fish, caught by hook and line in such places are

| | |
|---|---|
| The School and Old-man Trumpeter | *Latris hecateia.* |
| The Rock Gurnet | *Sebastes percoides.* |
| The Black and Silver Perch | *Chilodactylus macropterus.* |
| The Real Bastard Trumpeter | *Mendosoma Allporti.* |

Towards the surface of these open waters, the Maori "jig" and the swivelled barbless hook are employed in the capture of the rapacious though important market fishes—

| | |
|---|---|
| The Barracouta | *Thyrsites atun.* |
| The Kingfish | *Thyrsites solandri.* |

Altogether, it is estimated that out of the 188 known species of fish, there are about 63, or a third, good edible fish,—but only about 21 of these are sufficiently abundant to be considered as of any importance, so far as a regular market supply is concerned.

Large schools of sprats and anchovies are known to appear upon our coasts regularly, but there are neither establishments* amongst us for the preservation of such fishes, nor have we the suitable equipment, in the shape of nets, for their capture. In time this source of wealth may be opened to us. At present, want of knowledge, and possibly want of enterprise, operates against this valuable source of supply.

Trawl-nets have been tried on our coasts, but without good result. Either the class of bottom fish are absent in our waters, or the proper grounds have yet to be discovered suited for this mode of capture.

◆

## Freshwater Fishes.

Our Freshwater fishes,—and among these I include migratory species which necessarily live a portion of their existence in fresh water,—may with convenience be dealt with specially, and they naturally fall into two distinct groups; viz.—

1. The Indigenous Fishes.
2. The Introduced Fishes from Europe.

Among the former there are 15 species, belonging to eight distinct families and 11 genera; viz.—

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* Mr. Peacock, of Hobart, had tried to establish a preserving industry, but gave it up because he had not the skilled labour nor the proper *facilities for carrying* on the business successfully.

| | *Family.* | *Genus.* | *Species.* | *Common to Australia.* | *Common to N. Zealand.* |
|---|---|---|---|---|---|
| 1 | Percidæ | Lates | colonorum | • | |
| 2 | ,, | Microperca | Tasmaniæ | | |
| 3 | Triglidæ | Aphritis | Urvillii | | |
| 4 | Gadopsidæ | Gadopsis | marmoratus | • | |
| 5 | Haplochitonidæ | Haplochiton | Sealii | | |
| 6 | ,, | Prototroctes | maræna | • | |
| 7 | Salmonidæ | Retropinna | Richardsoni | • | • |
| 8 | Galaxidæ | Galaxias | truttaceus | | |
| 9 | ,, | ,, | attenuatus | | • |
| 10 | ,, | ,, | auratus | | |
| 11 | ,, | ,, | Weedoni | | |
| 12 | ,, | ,, | Atkinsoni | | |
| 13 | Muræenidæ | Anguilla | australis | • | |
| 14 | Petromyzontidæ | Mordacia | mordax | • | |
| 15 | ,, | Geotria | Allporti | | |

The most important among these, so far as the market is concerned, are—

1. *Lates colonorum* ........ Brackish-water Perch.
2. *Gadopsis marmoratus* .. Blackfish.
3. *Anguilla Australis* .... The Common Eel.
4. *Prototroctes maræna* .. The Freshwater Herring.
5. *Retropinna Richardsoni*. The Smelt or Whitebait.
6. The various species of *Galaxias*. Jolly-tails and Native Trout.

The first three are the only fish attaining any size; the remainder are small, valued for their quality as food, and in most cases for their wonderful abundance throughout nearly all the rivers and streamlets of Tasmania.

*Lates colonorum.*—Is a well known fish in Australian waters, but its distribution in Tasmania is confined, so far as is yet known, to one small river discharging into Anson's Lagoon, in the north-east part of Tasmania. It has more the appearance of a saltwater fish, and indeed, although it is not a sea-going fish, it is most frequently captured in brackish water at the mouth of small streams whose connection with the sea is frequently closed with shifting sand-bars. It is probably in this way that this genus had originally become acclimatized to the fresh water. The existence of this fish in Tasmania was only recently made known to the Society through the instrumentality of Mr. John Swan, who states in respect of it, that he had seen, about the end of June, 30 or 40 specimens in the course of two days, weighing from 1½ to 3 lbs. each, which were netted by Chinamen. Their stomachs were filled with small fish, which he stated resembled anchovies. The Chinamen *cut a slit down* the back of the fish, and put them into a composition which they keep secret; they then hang and dry them, without removing the intestines. A specimen preserved in this way, now in my possession for more than a year, is still in an excellent state of preservation.

The market for the fish captured by the Chinamen is chiefly among the tin-miners of Thomas's Plains.

It is most singular that this species, with the Blackfish *(Gadopsis marmoratus)*, should be identical with species found abundantly in Victorian Rivers, and wholly absent in all the southern waters of Tasmania.. The Unio *(U. moretonicus)*, and the Freshwater Lobster *(Astacopsis Franklinii)*, are also restricted to the rivers which discharge their waters into Bass's Straits. The peculiar inhabitants of northern rivers, therefore, are more Victorian than South Tasmanian in character, which is remarkable when we consider the present insular character of Tasmania. Mr. Wallace's theory of the original distribution of 'Island Life' receives ample confirmation from these and other facts known to me in connection with the Flora and Fauna of Tasmania.

The Blackfish *(Gadopsis marmoratus)*, whose singular distribution has been commented upon, is found in nearly all the rivers of Tasmania which flow into Bass's Straits. Their original absence in some northern streams, such as the South Esk,—which has recently been successfully stocked by Mr. Harrison and other pisciculturists,—is somewhat puzzling; but the total absence from all the other rivers and streams of Tasmania where the conditions are identical, can only be explained on the principles of geographical distribution as illustrated by Darwin and Wallace. I believe if the Fauna of Tasmania were specially studied by Mr. Wallace, that many of the opinions advanced by him in his last great work would receive ample and striking confirmation.

The Blackfish somewhat resembles a small Ling in markings and general appearance. It is much esteemed as food, and is a welcome fare to bushmen and settlers who are far removed from the centres of population. The fish usually are taken in considerable numbers by rod and line all the year round, the hook baited often with the large white grub (a species of moth obtained from the 'wattle' or 'honeysuckle,' (i.e., *Acacia dealbata : Banksia marginata)*. A good take can always be relied upon in most of the northern streams, especially in the Ringarooma, where, it is stated by Mr. John Brown, they have been known to reach a weight of 10 lbs. The average weight, however, runs from 3 to 4 lbs., except in the North Esk, where they run smaller than elsewhere. Mr. Brown and others who have observed our freshwater fishes closely, assert that they cannot distinguish the male from the female, although they have purposely opened hundreds of them. I have opened a good number myself, but at the time I did not know of this fact, and naturally supposed that they were ordinary females. I am inclined now to consider that they are bisexual, and will take the first opportunity to enquire into this matter more fully. Unfortunately, the specimens in my collection have the intestines removed. Blackfish are sometimes taken in the brackish water of tidal rivers.

*Anguilla Australis*, the Common Eel of Australia and Tasmania, is very abundant in all our rivers. Large numbers are caught in the Tamar and its principal tributaries, the North and South Esk. Some of the eels have been taken in the Ringarooma and South Esk Rivers over 30 lbs. in weight, and over 20 inches in girth. The market supply could be greatly extended if there were any demand for them.

*Prototroctes marœna*, the Freshwater Herring, or Cucumber Fish, although rarely exceeding ¾ lbs. weight, and 12 inches long, is perhaps the finest of our native freshwater fishes. It has an adipose fin, and is closely allied to the true Salmonoids of European waters. It is to a certain extent migratory; but whether it approaches the lower reaches of the streams to spawn in suitable redds, or whether it is necessary to approach the brackish water for some other reason, is not yet quite clear. They are stated by Mr. Brown to have been found in brackish water in the Tamar a considerable distance below the confluence of the North and South Esk Rivers. They are a clean cut, handsome shaped fish, with small head and elongate body, like a diminutive salmon. They are chiefly insect feeders, and during the season they at one time could be caught in vast numbers in nearly all our rivers. Although in many of our streams they appear to be again on the increase, it is remarkable that about 14 years ago they suddenly almost disappeared from most of our rivers where they were formerly plentiful. The general conclusion is that this disappearance of the herring was due to a wide spread epidemic. In some places it is stated that thousands of dead fish were seen floating down the rivers. The fins, eyes, and gill-covers appeared to be covered with a fungus. It is therefore likely that at particular periods they are subject to the widespread attack of some species of Saprolegnia, similar to that which attacks the *Salmo salar* of Scotch and English Rivers, as described by Professor Huxley. They are caught chiefly with rod and line,—a fly-hook baited with a "gentle" seems to be the mode of capture in greatest favour among sportsmen.

*Retropinna Richardsoni*, the Smelt of New Zealand, is also found in the various estuaries of Tasmania at certain periods of the year. It scarcely exceeds 3 to 4 inches long, and is usually found in myriads in the shrimp-nets, together with the silver-belly Sand-smelt *(Atherina, sp.)*, the Jolly-tail *(Galaxias attenuatus)*, and the Anchovy. The Jolly-tails, Sand-smelts, and Smelts are frequently termed 'Whitebait,' and are esteemed a great delicacy for the table. In the Tamar all these little fishes may be caught in vast numbers. Dr. Günther formerly supposed that *R. Richardsoni* was confined to New Zealand, but it is now known to be common to Australia and Tasmania also.

The various species of Native Trout *(Galaxias)* are more numerous, and are found more widely spread than any other freshwater fish in Tasmania. *G. auratus*, the Golden Lake Trout, is found at an altitude of nearly 4000 feet, while *G. attenuatus* is generally found at the lower levels, and are most abundant not far away from the influence of brackish water, which they freely enter. *G. truttaceus*, the Spotted Trout, is found in the inland streams; a variety ascends the mountain rivulets, and hence it is termed the Mountain Trout. They are all small fishes, with rounded scaleless bodies and flattened heads. The Golden Lake Trout *(G. auratus)* is the largest. Specimens of this fish, which is most closely allied to *G. truttaceus*, are in my possession measuring 11 inches long.

The Lamprey, though abundant in some rivers, seems not to be in favour in the market, as they are rarely seen there.

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### INTRODUCED FISHES SUCCESSFULLY ACCLIMATIZED IN TASMANIAN WATERS.

It is no small credit to Tasmania that she is the first Colony in the Antipodes which has succeeded in the remarkable achievement of stocking her waters with European fishes, from eggs hatched in her establishment at New Norfolk, on the Plenty, which were originally taken from the parent fish and artificially impregnated in England. The history of the Salmon experiment of Tasmania is now a famous one, and need not be enlarged upon here. It is necessary, however, that a brief reference should be made to it, and to the fishes now successfully established in our waters, and included among the Catalogue of Tasmanian Fishes. It is now nearly 33 years ago since Sir W. Denison, Mr. Burnett, Capt. Stanley, Mr. A. Young, and others, originated the idea of stocking Tasmanian rivers with the Salmon of Europe. Many trials and proposals were made, and repeated failures; but these experiments were in one sense a success, for they eventually led the minds of such men as Gottlieb Boccius and Mr. J. A. Youl, C.M.G., to ponder over and eventually to overcome all obstacles and difficulties. For, although the shipments of 50,000 ova in each of the years 1852, 1859, and 1862, by the *Columbus*, *S. Curling*, and *Beautiful Star* failed altogether, yet, mainly owing to the enthusiastic ardour and intelligent direction of Mr. Youl, in conjunction with English and Tasmanian naturalists, success at last crowned their labours by the safe arrival of the *Norfolk*, in the year 1864, with healthy impregnated ova, packed in moss, and surrounded by ice, in a suitable chamber.

Mr. Seager, the Secretary of the Tasmanian Salmon Commissioners, has kindly given me the following particulars. Of the 102,000 ova of *Salmo salar*, and 1500 eggs of *Salmo fario* (Itcham Trout), it is estimated that about 34,700 of the former and 300 of the latter arrived at the Salmon Ponds on the Plenty in a healthy condition; and of these it is further estimated that 3000 of *Salmo salar* and 300 *S. fario* were successfully hatched and eventually liberated in the Plenty. In 1866 another consignment of about 102,000 ova of *S. salar* and 15,000 of *S. trutta* arrived, from which about 6000 of the former and 496 of the latter were successfully hatched, and eventually liberated in the same tributary of the Derwent. The result of this has been that the River Derwent is now stocked with the migratory sea-going Salmonoids and the Brown Trout; while in all the principal rivers of the island the Brown Trout has been successfully established. Indeed, it is noteworthy that the Brown Trout hatched in the Ponds from a box of ova supplied by Frank Buckland and Francis Francis, are the progenitors of all the Trout which now exist in the Australian Colonies.

The following is a statement, also supplied by Mr. Seager, of the ova and fry forwarded to the various places between the years 1869 *and 1881 from* the breeding establishment *on the Plenty; viz.—*

| | *Fry.* | *Ova.* |
|---|---|---|
| To rivers and streams throughout Tasmania | 57,190 | 36,600 |
| Victoria | .. | 81,500 |
| New South Wales | .. | 21,500 |
| South Australia | .. | 20,000 |
| Western Australia | .. | 800 |
| New Zealand | .. | 18,850 |
| TOTAL | 57,190 | 179,250 |

For a fuller account of the Salmon experiment I have only to refer to the many interesting papers contained in the Proceedings of this Society contributed by the late Mr. Morton Allport, to whom also the success of the experiment in Tasmania is in a large measure due.

The ova were obtained originally from the following streams in England and Scotland—

*Salmo salar*—Ribble and Hodder, Lancashire.
Severn, Worcestershire.
Dovey, Wales.
Tyne, Northumberland.
Tweed, Scotland.
*Salmo trutta*—Tweed, Scotland.
*Salmo fario*—Itcham and its tributaries, near Southampton.

Among those gentlemen who rendered their valuable aid in procuring ova, and in forwarding the success of the various experiments, may be mentioned the following:—Mr. Frank Buckland, Mr. Brady, Mr. Francis Francis, Mr. Ramsbottom (father and son), W. Allies, and Mr. Johnston. In Tasmania we have associated with Mr. Allport the following gentlemen who have specially taken an interest in the introduction of the Salmonidæ from the first, viz.:—Sir Robert Officer, Dr. Milligan, Mr. John Buckland, Dr. Agnew, Mr. Curzon Allport, and Mr. Robt. Read, upon whose estate the Salmon Ponds have been constructed.

Besides the acclimatization of three species of Salmon, to Mr. Morton Allport is mainly due the successful introduction to our waters of the following well known European fishes:—

| | |
|---|---|
| The River Perch | *Perca fluviatilis.* |
| The Common Tench | *Tinca vulgaris.* |
| *The Crucian Carp* | *Carassius vulgaris.* |
| *The Golden Carp* | *Carassius auratus.* |

These are to be found in our various rivers, and are so well known that they need no description. Victorian and New Zealand Rivers have been successfully stocked from Tasmania with the River Perch, the Tench, and the Crucian Carp.

Of these latter the Tench is the only fish of importance which has become really abundant in Tasmania. The Perch seems to thrive well in certain lakes where introduced, but not to the same extent as the Tench.

With respect to the exact nature of the Derwent migratory Salmonoids, there has been much discussion as to whether the *Salmo salar* has really established itself or not. The handsome fish which is now so numerous in the estuary of the Derwent is within certain limits a most variable form, —some individuals being almost identical in all specific characters with the grilse form of *S. salar*, while others partake more of the character of the equally valuable *S. trutta* and its still more closely allied congener, *S. Cambricus*. It is clear to me, however, that the prevailing form found in salt water is a mean between these, and it is this overlapping of the closely agreeing characteristics of these so-called species which renders it so puzzling to determine to which of them any one individual belongs. The question, which has excited much interest in Tasmania, is confused by the notions of imperfectly informed persons, who, by the use of such a misleading common name as 'Bull Trout,' have led many to think that we have only succeeded in acclimatizing the common Brown Trout and its varieties in our waters, and they often, in ignorance, speak of our fine migratory fish as if it were a coarse, destructive fish of no value. It is to be regretted, where legislation may be concerned, that erroneous notions should be circulated in this way. By such people the fanciful views of amateur pisciculturists or sportsmen are deemed to be of equal value to the utterances of learned ichthyologists such as Dr. Günther, whose profound knowledge forces them to speak with extreme caution.

We only know as yet that we have a fine non-migratory Trout (the Brown Trout), and a splendid sea-going migratory Salmonoid. The question is, not *S. fario* versus *S. trutta*, or *S. fario* versus *S. salar*, but the more difficult one of determining whether the variable, handsome, migratory fish, which is frequently captured far out at sea, is (1) *S. trutta*, (2) *S. Cambricus*, (3) *S. brachypoma*, (4) *S. salar*, (5) *all of these in* variable numbers, (6) a hybrid *partaking in varying degrees* of the characters of the four named species, or (7) one or other of those named but modified by transfer to a new environment. If the individuals which prevail agreed with or fell within the classified limits of any one species we would not have the slightest difficulty in determining their specific value; but when no one individual comes exactly within the limits of the written characters, it is necessary that the seven propositions advanced by me should be answered satisfactorily before any one can pronounce with confidence on the subject.

Mr. Allport, who knew very well the niceties of distinction between *S. salar* and *S. trutta*, inclined strongly to the opinion that our Derwent Salmonoids are grilse of the former, and not *S. trutta*. Dr. Günther and Professor M'Coy have had the disadvantage of determining the nature of the species from single individuals sent to them at odd times. They consequently, from such disconnected points, could have no means of determining the curve of variability, and I am not surprised therefore that, respectively, at different times, they have pronounced certain individuals to be *S. salar*, *S. trutta*, *S. Cambricus*, and a hybrid between *S. salar* and *S. trutta*. Odd specimens cannot determine the curve of variability, nor can they determine whether the four fish, so differently named, were not after all the progeny of the same parents.

The following are curious facts. A Brown Trout, caught in the Mersey, with a coarse head, weighing 22½ lbs., girth 24 inches, contained 7 lbs. of very large mature ova. Each ovum was of a pale straw colour, with a conspicuous pinkish nucleus. The colour of the pinkish nucleus gave a decidedly pinkish tinge to the ova in mass. The pectoral fin of this fish had 16 distinct rays.

A short, but silvery variety of Brown Trout, which frequents the wharves in brackish water at Launceston, weighing about 5 lbs., has pinkish flesh, and well-developed pyloric appendages. In one individual I counted as many as 72, all of them larger than the average size. A fish of similar habit, called by some "White Trout," is found, common, in brackish water at Bridgewater. The latter, however, is generally more elongate, and individuals have been captured over 22½ lbs. in weight.

A handsome migratory Salmonoid, caught recently below Bridgewater, weight 9 lbs., total length 28 inches. In colour, form of body and tail, shape of caudal and other notable characters, it agreed with the characteristics of *S. salar*; yet in the tail series of transverse scales, certain characters of the operculæ, the slightly obtuse snout, and in the relatively long maxillaries, were more in accord with the characteristics of *S. trutta*. The shape and number of pyloric cæca were within the overlapping number common to both.

It is begging the whole question to assume hybridism when the prevailing type is similarly variable, unless we assume also that the ova of one species were artificially impregnated by the semen of the other by mistake prior to dispatch from England. This is conceivable; but when we consider the names of those who carefully selected the fish in England which were stripped, it is not at all probable. Besides, the theory of hybridism is to me extremely unsatisfactory. It assumes that we know the exact measure of the external influence of varying light, food, and the local nature of the medium in which these animals exist. The extraordinary facilities for intercrossing among fishes naturally must also be taken into consideration, together with the fact that the extremes of each type steadily perpetuate themselves in European waters.

As directly bearing upon this subject, it is noteworthy that already in New Zealand and Tasmania the allied non-migratory species, *S. fario*, var. *Ausonii*, has developed into distinct types, which are peculiarly characteristic of particular streams. This clearly shows that differences of this kind are not sufficiently fixed to remain unaffected by environment,— that they are in fact *racial* and subordinate to influences of immediate environment, and not fixed or specific, and remaining constant in spite of such accidental influences.

## Marine Fishes.

### BERYCIDÆ.

There are only two known representatives of this family in Tasmanian waters, viz., *Beryx affinis* (G.): *Trachichthys Macleayi*, (Johnston). They are seen on rare occasions, and are consequently of little importance from a utilitarian point of view. The greater number of genera belonging to the family live at great depths. The genus *Beryx* is sometimes found at a depth of over 300 fathoms.

### PERCIDÆ. *The Perch Family.*

This family is of considerable importance. It is represented in Tasmanian waters by ten genera and thirteen species.

So far as the fish market is concerned, the most important members are—

| | |
|---|---|
| 1. *Anthias rasor* .... | Tasmanian Barber or Red Perch. |
| 2. *Arripis salar* .... | Native Salmon. |
| 3. *Arripis truttaceus*.. | Native Salmon Trout. |

The first of these is generally caught in the winter season, along with the Trumpeter *(Latris hecateia)*; and although not taken in great quantity, it is nevertheless, from its quality, highly esteemed.

The Native Salmon *(A. salar)* are brought to market in the greatest abundance all the year round. They enter rivers and approach wharves in myriads at certain seasons, chiefly in spring, and afford the angler passable sport, as they dash greedily at bait or artificial fly, and sometimes are known to vie with their noble namesake in the plucky manner in which they play the sportsman's reel. It is almost certain (as stated by Prof. M'Coy) that the Native Salmon Trout *(A. truttaceus)* is but the immature form of *A. salar*. In the young state they are barred or spotted,—the markings becoming fainter as they increase in size, and disappearing altogether in the mature forms. They are of handsome shape, sometimes reaching 7 lbs. weight. They are most esteemed for food, however, when they are under 1 lb. weight.

The other members of the group are unimportant either as regards size or numbers brought to market.

### MULLIDÆ. *The Red Mullet Family.*

The only known member of this highly-prized family of fishes is the Red Gurnet or Red Mullet of our fishermen *(Upeneichthys porosus)*. It is very scarce, however, for it is seldom seen in the market.

### SPARIDÆ. *The Bream Family.*

Of the Bream family there are five representatives in Tasmanian waters; viz.—

| | |
|---|---|
| 1. *Chrysophrys australis*, Günth. | The Common or Silver Bream. |
| 2. *Girella tricuspidata*, Cuv. and Val. | The Black Bream. |
| 3. *Girella simplex*, Rich. .. | The Sweep. |
| 4. *Pagrus unicolor*, Cuv. and Val. | The Snapper. |
| 5. *Haplodactylus arctidens, Rich.* | |

Although all the members of this family are valuable food fishes, there are only three of the list which are sufficiently numerous on our Tasmanian coasts to claim our attention as affecting the market supply, viz., the Silver Bream *(C. australis)*, the Black Bream *(G. tricuspidata)*, and the Sweep *(G. simplex)*.

The first of these, the Silver Bream, enters the brackish waters of creeks and rivers during the summer months in considerable numbers. They subsist chiefly upon crabs and other hard-shelled animals which abound in such places, and which they crush with their strong jaws, armed as they are with rows of molar teeth. They are supposed to shed their spawn in the brackish shallows during the months of November and December, returning to the sea before the close of June. At the mouth of Brown's River, the Jordan, the Scamander, and other favourite places, the amateur fisherman could always find abundance of sport in former years; but, latterly, in some of these places their numbers appear to have greatly diminished, chiefly caused, it is affirmed, by the use of fixed nets across the mouths of the streams, by which large quantities of the immature fish are ruthlessly destroyed, and possibly obstructing the ingress of the mature spawning fish. It would be well if a stringent measure were passed by Parliament prohibiting the use or otherwise limiting the fixture of nets in such situations.

The Sweep *(Girella simplex)* and the Black Bream *(Girella tricuspidata)* are not taken in much abundance towards the south of Tasmania, nor do they seem to ascend the estuaries so freely as the Silver Bream *(C. australis)*. They are principally vegetable feeders,—their rows of fine incisors, frequently tricuspidate, being well adapted for the purpose. They are most frequently taken together in nets (graball) in the bays of the North-West and North-East Coasts, particularly the Tamar, Port Sorell, Bridport, the Mersey, George's Bay, and the Scamander. Those sent to Hobart are generally caught at Southport.

The Snapper *(Pagrus unicolor)* is seldom seen in the southern waters of Tasmania, even where the reefs, depth of water, and other conditions seem to be favourable. This splendid fish seems to favour the warmer latitudes, for it abounds, and forms the chief market supply, along the coasts of Australia. Its place in Tasmanian waters, especially in the south, seems to be occupied by the Trumpeter family *(Latris)*, which latter seems to favour the deep fringing reefs of the colder southern latitudes. The North Coast of

Tasmania lacks the deep fringing reefs which seem to be the favoured resort of the Snapper. This may account for the rare appearance of this fish on our northern coasts, where, from other considerations, it might be expected to be found.

The fifth representative *(Haplodactylus arctidens)* is referred to by Dr. Richardson as found at Port Arthur, but it is seldom seen in the market. It has simple lanceolate incisors, and is a vegetable feeder, like the Sweep and Black Bream.

### SQUAMIPINNES.

It is very doubtful whether we have any representative of this family in Tasmanian waters, although the species *Scorpis Georgianus* (C. et V.) has been stated to have been seen. It is, consequently, of little interest as regards the local fish market. Dr. Günther states with respect to this family, that they abound chiefly in the neighbourhood of coral reefs; and that the beauty and singularity of distribution of the colors of some of the genera are scarcely surpassed by any other group of fishes. Comparatively few are used as food. They are carnivorous, feeding on small invertebrates.

### CIRRHITIDÆ. *The Perch and Trumpeter Family.*

This is by far the largest and most important family, so far as the edible fishes of Tasmania are concerned. It comprises 6 genera and 13 species, chief among which are—

The Real Trumpeter *(Latris hecateia)*, Rich.
The Red and Silver Bastard *(Latris Forsteri)*, Cast.
The Black and Silver Perch *(Chilodactylus macropterus)*, Perkins.
The Carp *(Chilodactylus Allporti)*, Günther.
The Magpie Perch *(Chilodactylus gibbosus)*, Rich.
The Real Bastard Trumpeter *(Mendosoma Allporti)*, Johnston.

The first of these, the Real Trumpeter, or Hobart Trumpeter, is brought to market in considerable abundance all the year round, and is deservedly held in repute as the finest of the Australian edible fishes. It commands a ready market in the neighbouring Colonies, whether fresh, smoke-dried, or salted. Many, indeed, consider the smoked Trumpeter equal, if not superior, to the Finnon Haddock of Scotland *(Gadus æglefinnis)*. It is therefore worthy of special notice.

The Trumpeter proper is readily known from the other members of the genus by its finer and more elongate head, and the three or four characteristic longitudinal white bars along the sides of its body. It is very limited in its distribution, and favours the colder southern waters of the Island. The fish are generally found on what are described by the fishermen as coral reefs or banks, 10 to 70 fathoms deep, and 3 to 10 miles off the land. These banks are distributed all round the southern coast of Tasmania, from Macquarie Harbour, in the west, to Seymour, in the east. There is no trustworthy record of Real Trumpeter being caught much further north.* It has been reported that *Latris hecateia* has been found off the coast of Victoria; but, as there are two or three Victorian smacks which regularly fish in Tasmanian waters and bring their fish into Port Phillip direct, it is possible that the supplies so brought into market might be confounded with the supplies brought from the Victorian coast. The duty at one time imposed upon Tasmanian fish might also tend to favour such a belief.

In searching for the right fishing banks, the fishermen test the bottom with heavy sinkers shod with grease. Should there be any traces of coral they consider them favourable indications of the presence of the fish, and they at once proceed to sink their lines, even though it should be 70 fathoms deep. The lines are baited with Crayfish *(Palinurus Edwardsii)*, or, afterwards, Sharks' flesh when the fish come about.

The Real Trumpeter takes bait readily; but, owing to the great depth and strong currents upon these outer reefs, the large deep-water Trumpeter has never been attempted to be taken in nets. All the boats employed in fishing for Trumpeter are termed well-boats,—being fitted up with a chamber to which the fresh sea-water has free communication by numerous perforations on the bottom and sides. Immediately the fish are hauled in they are placed in these open wells, and are thus preserved alive until sold in market. Real Trumpeter will thus feed in confinement; and they have been known to live over three months in the well-boats after capture.

There are two well-marked varieties of Real Trumpeter brought to market in Hobart. The one, the Deep Coral-reef variety, large, and usually full of roe or milt, frequently attains a weight of from 15 to 20 lbs. Specimens have been captured weighing over 60 lbs. The other, termed Pair or School-fish, is smaller, with a darker hue along the back, with yellowish tinge over the lighter parts, especially on throat and belly. The latter is usually found on a rocky bottom, in shallower water, near shore,* and in this state is never found with mature genital organs, and rarely exceeds 6 to 7 lbs. weight. Unlike the immature Bastard, however, the School-fish or Black Trumpeter, which is most probably the immature form of the Deep Coral-reef Trumpeter, is held in most esteem as an article of food, and commands a higher price in the market. The fishermen are of opinion that the two forms represent distinct species; but, as the general characters are identical,—viz., D. 17 : 1·36-38. A. 3·28-30. P. 9·8-9. L. lat. 110,—and as the smaller form caught in shallower water is never found with the genital organs mature, it is most probable that the latter is the immature form of the larger. It is likely, just as in the well-marked type of Red Bastard Trumpeter *(Latris Forsteri)*, that they seek the deeper coral reefs as they approach maturity. No other conclusion seems possible, taking all the facts into consideration.

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* Mr. Barrett has since assured me that two specimens were caught near Waterhouse Island in the neighbourhood of deep water.

The Bastard Trumpeter *(Latris Forsteri)*, D. 16 : 1·37-42. A. 3·33-36. P. 9-10·8-9. L. lat. 115-120. Scarcely inferior to the Real Trumpeter, and superior to it in abundance all the year round, comes the Bastard Trumpeter, especially the well-conditioned mature variety known as the White or Silver Bastard. The latter, or mature form, however, is only taken during January, February, and March. This fish has hitherto been confounded with *Latris ciliaris*, (Forst.); but, although the latter species has been reported as existing in Tasmanian waters, it is most probably a mistake: for the two varieties, (the red and white), found in such abundance here, have the general characters as shown above; and although some of them vary within certain limits, there is little doubt but that they must be referred to the *Latris Forsteri* of Count Castelnau, which appears to be the Bastard Trumpeter of Victorian waters. It is true that Castelnau's *L. Forsteri* is described as having only two spines in the anal fin; but most probably this is simply a mistake, and that the Victorian *L. Forsteri* has three spines like all the other representatives of the genus.

The following diagnoses of certain external characters taken indiscriminately from a dozen specimens, will give to ichthyologists a notion of the variability of some of them; and when we consider to what extent age and local surroundings modify shape, colour, &c., it may be conceded that it would be hazardous to fix the limits of a species of this genus from an odd or immature individual:—

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* *They have* been known to ascend the estuary of the Derwent as far as *Hobart.*

*Latris hecateia*, (Rich.) The Real Trumpeter.

| | D. | A. | P. br. s. | V. | L. lat. |
|---|---|---|---|---|---|
| (1) | 17 : 1·37 | 3·29 | 17 = 9 8 | 1·5 | 110 |
| (2) | 17 : 1·38 | 3·30 | 18 = 9 9 | 1·5 | 110 |
| (3) | 17 : 1·36 | 3·28 | 17 = 9 8 | 1·5 | 110 |

*Latris Forsteri*, (Cast.) Bastard Trumpeter.

***Red variety.***

| | D. | A. | P. br. s. | V. | L. lat. |
|---|---|---|---|---|---|
| (4) | 16 : 1·40 | 3·36 | 18 = 9 9 | 1·5 | 115-120 |
| (5) | 16 : 1·40 | 3·35 | 17 = 9 8 | 1·5 | 115-120 |
| (6) | 16 : 1·37 | 3·33 | 18 = 10 8 | 1·5 | 115-120 |
| (7) | 16 : 1·42 | 3·34 | 19 = 10 9 | 1·5 | 115-120 |
| (8) | 16 : 1·41 | 3·38 | 18 = 9 9 | 1·5 | 115-120 |

***White or Silver variety.***

| | D. | A. | P. br. s. | V. | L. lat. |
|---|---|---|---|---|---|
| (9) | 16 : 1·38 | 3·34 | 19 = 10 9 | 1·5 | 115-120 |
| (10) | 16 : 1·40 | 3·36 | 18 = 9 9 | 1·5 | 115-120 |
| (11) | 16 : 1·39 | 3·34 | 18 = 9 9 | 1·5 | 115-120 |
| (12) | 16 : 1·41 | 3·33 | 18 = 10 8 | 1·5 | 115-120 |

There are to be found individuals which link the two latter varieties imperceptibly together. In exact shade of colour, and number of soft fin rays, scarcely two individuals agree; and hence I am of opinion that the *Latris bilineata* and *L. inornata* of Count Castelnau are merely immature forms of the one variable species common to the waters of Victoria and Tasmania. The first spine of the anal in young specimens may be easily overlooked, and frequently I have observed that in extracting the fish from the meshes of the graball the same spine readily gets broken off. This may account for the anal spines being recorded as 2, instead of 3, in the odd individuals erected into specific rank by Count Castelnau.

The Bastard Trumpeter attains a length of about 21 inches, and rarely exceeds 6 to 7 lbs. weight. It is most prized for food in the Silver Bastard, or mature well-conditioned form. It differs from the Real Trumpeter chiefly in the absence of vomerine teeth, and of the longitudinal bars of light colour along the sides. *It has* a more broadly oval shape, a *shorter and thicker head, and* a more fleshy and obtuse snout.

It has, moreover, invariably one spine less in the anterior dorsal; is most abundant on the shallow banks of estuaries, 3 to 6 fathoms deep; enters brackish water more freely; and, unlike the deep coral-reef variety of the real trumpeter, it is generally captured in nets, and rarely takes a bait of any kind. For these reasons it is perhaps scarcely desirable that this abundant species should be included within the same genus as the Real Trumpeter *(i.e., Latris)*. Fishermen generally regard the red and silver varieties of the Bastard Trumpeter as distinct species. The reasons given by them are various, but they generally concur in stating that the red is generally a somewhat smaller and leaner fish; it is almost invariably found on a weedy bottom near shore, and in the upper shallow banks of estuaries, all the year round: while the silver, or white form, is larger, better flavoured, better conditioned, and, for the most part, is generally taken in deeper water in the neighbourhood of reefs towards the mouths of estuaries, during three months of the year only. It is significant, however, that they (the fishermen) generally concur in the statement that the red are always lean, and the silver are as invariably fat. The Red Bastard is rarely caught with maturely developed genital organs,—indeed, the fishermen are mostly all of opinion that they are entirely absent in white and red; but this is a mistake, founded probably upon the circumstance that a large white fatty mass invariably covers and nearly conceals the genital organs of the Silver Bastard, while the undeveloped condition in the red is sufficient to justify the erroneous opinion in respect of its supposed sterility.

With regard to the exact spawning season and the spawning-grounds of the Real and Bastard Trumpeter, little is known. We may recapitulate what has been learned, however, with respect to the former:—They are only found with the genital organs in a mature state in the outer coral reefs, 10 to 70 fathoms deep; the School-fish, which are in all probability the half-grown, or immature, are however found in shallower rocky bottoms nearer land, although an odd one of the latter may be caught at times among the mature forms in deep water. It is probable, therefore, that the mature fish spawn on the reefs in deep water; that the young fry afterwards approach the shallower rocky bottom nearer shore, where they grow up into the stage known as "School-fish." As these approach maturity they return to the deep coral reefs from whence they originally migrated.

The movements of the Bastard Trumpeter are probably very similar to those of the Real Trumpeter. Only the *Silver form, found* on what may be termed the reefs of the middle fishing-grounds, appear to be found with mature genital organs; and although it has been shown that the "Paper-fish," or fry, and the Red Bastard, which are most probably the immature state of the Silver form, are found in large numbers in the upper shallow banks of the estuaries, yet it is rarely the case that a mature Silver Bastard is caught in such situations. As the Red Bastard is seldom found mature in these shallows, it follows that the parents must spawn towards the middle-ground reefs, *i.e.*, 5 to 6 fathoms water; that, like the Real Trumpeter, the young fry afterwards approach the upper shallow weedy banks, remaining there until the half-grown poor condition of the Red Bastard, when they again return to the parent ground on the reefs of the middle grounds—6 to 7 fathoms deep—where they speedily, from changes in the nature of the food, or from the altered conditions of the bottom as affecting the light transmitted to them, they assume the rounded proportions and the more silvery appearance of their parents. It is also significant as bearing upon the unity of the two varieties, that the colour of the Red form varies to a remarkable extent: sometimes it is uniformly dark rusty brown on snout, head, and along the back and shoulders, lighter and becoming quite silvery under the lateral line; at other times the color is a much brighter red. There are fine longitudinal streaks of light yellow along the junction of each row of scales; they are deeper on the side near lateral line, becoming obsolete towards belly. These streaks are, however, extremely variable; sometimes they are bilinear, with uncolored spaces of equal breadth between each streak. In the latter case there are generally two well marked olive-colored streaks above, and the same number immediately below the lateral line. Frequently, in both cheeks and opercles, plumbous, with a tinge of pink; cavities of protractile jaws green and blue; throat and tongue very deep blue, almost black. The young are always colored, more or less, like the Red, and are known by some as "Paper-fish." The mature form of the Silver Bastard is alone caught. This is conclusive as favouring the opinion that the Silver is simply the mature form of the Red,—the latter seeking the deeper water and gradually changing condition and colour as they grow older. We have still to account for the total disappearance of the Silver, or mature form, during the 9 months of the year from the reefs where they are usually caught by nets. It would appear from the evidence of intelligent fishermen, that they migrate to the outer deep-water reefs, 30 to 70 fathoms deep, where an odd one is now and again caught by hook and line while fishing for the bait-taking Real *Trumpeter*. It must be borne in mind *that the Silver or Red Bastard* rarely take bait, and hence the odd ones caught on these deep grounds when they have disappeared from the breeding-ground of this species (6 to 7 fathoms) are no index whatever of their numbers in deep water.

It has been stated that, by the improper use of seine-nets, immense quantities of the Paper-fish and other young fry are every season ruthlessly destroyed upon the sandy beaches, and that the valuable mature Silver Bastard and other important market fish are becoming scarcer every year. It is reasonable to suppose, therefore, that the wanton destruction complained of in the upper waters of estuaries may have more to do with the increasing scarcity of the Silver Bastard in the outer reefs than the cause usually advanced by the fishermen themselves, *i.e.*, over-fishing.

If it be satisfactorily proved that the Paper-fish thus referred to are really the fry of the Silver Bastard (and there is little doubt of this), it is imperative, in the interests of our fishermen and our permanent fisheries, that some means should be devised for the better protection of the nursery grounds of these important fishes in the upper waters of estuaries.* The deep-water fishes, like the Real Trumpeter, whose young do not seem to ascend as a rule into the upper waters of estuaries, have only their natural enemies to fear, as they are beyond the reach of the destructive seine-net when drawn up upon the sandy beaches. The young of other fish, such as the Perch *(Chilodactylus macropterus)*, the Horse Mackerel *(Trachurus trachurus)*, the Mullet *(Agonostoma Forsteri)*, the Garfish *(Hemirhamphus intermedius)*, the Flounder *(Rhombsolea monopus)*, and, indeed, the introduced migratory Salmonoids, are also known to be destroyed in a similar manner.

### The Black and Silver Perch, *(Chilodactylus macropterus* and *Chilodactylus asperus.)*

The Black and Silver Perch are the next in importance to the Trumpeter group as regards quality and supply. The form known as the Black Perch is particularly an excellent fish,—some preferring it to the Real Trumpeter. The young are to be caught on the numerous rocky banks, in three to four fathoms water, in the upper bays of the estuaries, especially in those of the Derwent. They are in this state found in more or less abundance all the year round, and are highly esteemed for the breakfast table. In the various bays in the immediate vicinity of Hobart the young Silver Perch, 7 to 8 inches long, afford ample sport to amateur fishermen. The fish take bait readily,—the mussel, boiled, being a favourite; and, during the months of March, April, and May, it is not uncommon for a party of two or three persons to catch from ten to twenty dozen in a couple of hours. The young specimens are invariably of a bright silvery appearance, with a conspicuous dark-coloured transverse bar across the shoulder and posterior lobe of operculum, and terminating towards root of pectorals. This bar becomes obsolete, or is not so conspicuous, in the mature form; and this may partly account for some of the confusion which still exists in the classification of this most variable species. The pectoral fin has one of its simple rays prolonged far beyond the rest; and this simple character readily distinguishes it from nearly all the rest of the family.

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* A law which would regulate the mesh and the mode of using nets in such places might be devised. The working of such a measure might be committed to the existing Salmon and Fisheries Commissions, whose functions might be extended accordingly.

The Black Perch *(C. asperus)* is most probably a mere variety of *C. macropterus.* The former is found invariably upon a rocky bottom, and the latter upon a sandy bottom; and the colour is, undoubtedly, the result of the difference in local environment. The young are all silvery.

This species is most variable within certain limits. No two individuals are alike in all the following characters; viz.—dorsal, spinous, and branched rays, anal soft rays, length of longest simple pectoral ray, length of ventral fin, shade of colour. The Black Perch is only distinguished from the Silver by its condition and quality; in all other respects its general character varies within the same limits. Out of twelve specimens, Black and Silver, taken hap-hazard, the general characters of both forms varied in each individual within the following limits:—

D. 17-18 : 25-28. A. 3 : 12-14. P. 15 (9+6).
V. 1·5. L. lat. 55+4. L. tr. 6: 13-14.

In some the ventral fin did not reach to the vent; in others it reached as far as the vent; while in one or two individuals it extended beyond the vent. The longest simple ray extends to varying distances between the first and sixth soft rays of anal. Generally the Black Perch is found in deeper water, and attains a greater size. They were in former times found in great abundance in Adventure Bay. They do not carry them *in the* wells as a rule, however, as they *prick each other with* their strong dorsal spines, and so kill and disfigure themselves. This renders it more difficult for fish of this class to be brought to market. Fishermen have to cure them partially when they are hindered in any way from reaching market. Although some are caught in nets with the Bastard Trumpeter, they are usually caught by hook and line. The remarks applying to the destruction of the Bastard apply equally to the Perch. It is most probable that the mature fish spawn in five to six fathoms water; that, like the Trumpeter family, the young immediately after seek the upper shallow banks of estuaries, remaining there until they are half-grown, when they again gradually return to the parent ground, towards the mouths of estuaries.

### The Carp. (*Chilodactylus spectabilis*, Hutton: *C. Allporti*, Günth.)

Although the Carp of the fishermen is common in the market, it is not to be depended upon, for the few that are caught are only found at odd times in the graball while fishing at the mouths of estuaries for the Bastard Trumpeter. There is a ready market for all that are taken, however, for, although somewhat coarse-looking fish, they appear to be highly esteemed. They are, moreover, strong fish, and will live a considerable time in the well. They are seldom taken by hook and line. Little is known of their habits. The fish is of a reddish colour, with about six darker transverse bars across the sides. It was formerly known as *Chilodactylus Allporti*; but Dr. Günther has recently referred our local form to the *C. spectabilis* (Hutton), found also in New Zealand. If the description given by Prof. Hutton be correct as regards the prevailing form in New Zealand, it may be doubtful whether the suppression of *C. Allporti* was advisable, as the description of the latter is different in important characters. The Tasmanian form invariably agrees with Dr. Günther's description:—

| | *C. spectabilis.* | *C. Allporti.* |
|---|---|---|
| Height of body in total length—times ...... | more than 3 times | 2⅓-2¾ |
| Longest ray of simple pectorals .......... | 1st | 2nd |
| Head contained in total lengths ............ | 4¼ times | 4 times |
| Dorsal anterior spinous | blackish | light red |
| posterior soft.. | ditto | blackish |

If the differences as shown are constantly maintained in the New Zealand form, it may be advisable to retain the specific name *C. Allporti* for the Tasmanian species. Like the Carp, the Magpie Perch *(C. gibbosus)*, and the Real Bastard Trumpeter *(Mendosoma Allporti)*, are only taken in limited numbers during certain seasons, upon the Perch and Trumpeter ground. They are both good table fish, however; and it may yet be an important matter to study their habits and movements more closely. It is known that the Real Bastard runs in schools; and large numbers have at times been caught at the Schoutens and at Bicheno. Mr. Barnett, who has great experience as a fisherman in Tasmanian waters, states that they are only good for food when full of roe. I was somewhat astonished, two or three years ago, to find that this fish, which is not altogether an uncommon one in our market, should have escaped the notice of former classifiers. It was described by the writer in the Proceedings of the Royal Society of Tasmania, 1880, pp. 54-56. The following are its general characters:—

B. 6. D. 23 : 1·25. A. 3·18. V. 1·5. L. lat. 76. L. tr. 5 : 16.

The larger scales, greater number of dorsal spines, and the small pointed head with protractile jaws, readilv distinguishes it from the members of the Trumpeter group proper.

### TRIGLIDÆ.

This is also a somewhat important family of fishes in Tasmanian waters,—consisting of eight genera and eleven species. It includes the fish locally known as the Rock Gurnets, the Flatheads, and the Butterfly, Kumu, and Flying Gurnards. The Rock Gurnet *(Sebastes percoides)*, found more abundantly in the northern coasts, is held in great esteem for the table, and is obtained in the vicinity of George Town in considerable numbers. The various individuals are brilliantly coloured red and orange; and, like all its family, are well armed with dangerous head bucklers and sharp spines. The Common Flathead *(Platycephalus bassensis*, Cuv. and Val.), is, however, the most important member of the family on our coasts. The Flatheads are rather repulsive-looking fishes, with reptile-looking flattened heads and bodies; and their sharp gill-cover spines make it awkward for the inexperienced hand when they are captured by hook. They are termed "bottom fish,"—their flattened under surface being well adapted for following close the surface of the ground, like the common Flounder. They may be considered the scavengers of our shallow waters, for they are found everywhere around our coasts, in estuaries and around wharves, all the year round. When no other fish can be obtained the Flathead may always be depended upon. They are good edible fish, and would be much more highly prized for the table were it not that they are repulsive-looking and are so common.

As regards appearance, the following three members of the family present a wonderful contrast to the last; viz.—

The Butterfly Gurnard *(Lepidotrigla vanessa)*, Rich.
The Flying Gurnard *(Trigla polyommata)*, Rich.
The Kumu Gurnard *(Trigla Kumu)*, Less. & Gaim.

At times during the winter season these most beautifully coloured fishes, with their gaudily painted pectoral wings, may be seen around our wharves in small schools, dashing, or rather flying through the water, with sudden bounds after their prey. The pectoral fin is a most beautiful object, measuring, expanded, in some individuals of the Flying Gurnard, six inches long by six broad. The under surface is most brilliantly coloured blue, orange, and red, with pure white and blue margins. There are two large conspicuous black patches near the base, which, bordered with deep blue and white, form a most beautiful object in this fish, with its body-scales of burnished golden-yellow and silver. They are rarely captured, however, on our coasts, and are therefore unimportant here from a commercial point of view. It would appear that they are caught more frequently off the coasts of New Zealand. Latterly, the family *Triglidæ* has been divided into two,—the Gurnet group, under the name *Scorpænidæ;* and the Flathead and Flying Gurnard group, under the name *Cottidæ.*

## TRACHINIDÆ.

This family is represented in Tasmanian waters by five genera and six species. They include amongst them the Cat Fishes, the Freshwater Flathead or Sandy, and the much prized Whiting. Indeed, for commercial purposes, the latter is the only member of the group which need engage our attention. The Tasmanian Whiting *(Sillago ciliata*, Cuv. and Val.,) is a most valuable market fish. It fetches a higher price in the market, for its size, than any other fish. These fish are usually taken in seine-nets, during the months of November, December, and January, in the Derwent and along the East Coast. They also may be taken with hook and line; and a dozen or so are frequently captured in this way at odd times in the upper waters about Sandy Bay as late as July. They go in schools; but they are stated to have greatly fallen off in numbers during the last year or two. The reason for this decrease has not yet been satisfactorily determined. They are a delicious little fish, averaging a quarter of a pound in weight, silvery, with elongate snout and body. The sides are faintly marked with yellowish bars, which become obsolete towards belly.

### SCIÆNIDÆ.

There is undoubtedly one member of this family in Tasmanian waters, although it is rarely seen in the market. It is termed the " Kingfish " in Victoria, although it must not be confounded with *Thyrsites Solandri* (Cuv. & Val.), our " Tasmanian Kingfish." The fish belonging to this family is thought by Dr. Günther to be the " Maigre" of European waters—*Sciæna aquilla*. Other naturalists, however, have considered the Australian species to be distinct from the European one, and the late Count Castelnau has given it the name of *S. antartica*. It is just possible that there may be two species, but this is extremely doubtful. Dr. Günther states the members of this family prefer the neighbourhood of the mouths of large rivers, into which they freely enter, and he also attributes their scarcity in Australia to the fewness of large rivers which enter the occan.

### TRICHIURIDÆ.

This is not a large family of fishes in Tasmanian waters, but the individuals of one genus at least are so abundant, and all the members are so valuable as food, that it may be even reckoned on equality with the Trumpeter group in importance as affecting the market supply. The family comprises the following species; viz.—

| | | |
|---|---|---|
| 1. | *Lepidopus caudatus* .... | The Frost Fish. |
| 2. | *Thyrsites atun* ........ | The Barracouta. |
| 3. | *Thyrsites Solandri*...... | The Tasmanian Kingfish. |

The first of these, " The Frost Fish," is common from the south of England to the south of New Zealand. A specimen was recently taken in the Derwent which measured 5 feet 6 inches long; greatest depth of body behind shoulder, 6 inches; least depth at tail peduncle, three-fourths of an inch; thickness, not much more than an inch. It is captured at odd times during the winter season, and has been known to enter the Derwent as far as Sandy Bay. It is esteemed as the most delicious of all the edible Fishes in New Zealand, where it appears to be caught more frequently.

The next species, " The Barracouta," is caught all round the coast, especially at the mouth of the Derwent, in the greatest abundance, *during* ten months of the year, (*November to October). These* fish prey upon the shoals of young or small fry which swim near the surface—principally sprats, anchovies, &c.; although they are so swift and rapacious that even the English "Sea Trout" and other large fish fall a ready prey to them. In the absence of the still more terrible Kingfish (*T. Solandri*), they reign supreme amongst the scale fishes; their strong jaws, armed with terrible looking teeth, rendering them a most formidable enemy. The fishermen usually take the Barracouta by a rude instrument, first used it is believed by the Maories, and termed a "jig." The jig is simply a long stick, from the extremity of which a wire or cord is suspended, armed with a double hook attached to a small block of wood. Upon these hooks a bit of colored cloth, or the skin of a shark, may be attached. When the fish are about they may be jigged aboard with wonderful rapidity while the vessels are sailing at any speed. Great quantities are thus caught and brought to market, where they are much esteemed, and, for a limited quantity, command a ready sale. The local market, however, is so limited, that it is easily overstocked; and, although a large quantity is exported, there is not sufficient demand to encourage the fishermen to extend the supply.

There appears to be no systematic curing establishments, where large quantities might be profitably disposed of. Dr. Hector states that dried Barracouta are imported into the Mauritius and Batavia as a regular article of commerce, being worth £17 per ton. This being the case, I am surprised that a trade in this fish, which can be got in the neighbourhood of Hobart almost in unlimited quantities, is not more systematically and extensively carried out. The fish usually measures about three feet long, and averages 8 lbs. in weight. Fishermen say that it would pay them if 3*s.* a dozen could always be got for them, *i.e.*, under ½*d.* per lb. Surely with such a fine fish as this better results might be obtained. It is a reproach to our local enterprise when fishermen complain that "at times there are so many caught that no price can be got for them."

These remarks equally apply to the next important member of this genus, the Tasmanian Kingfish (*T. Solandri*). This species appears upon our Southern coasts, at times in immense numbers, the height of the season being May and June. Three fishermen have frequently been known to capture over 40 dozen of these fish in a single night, each fish averaging 12 to 14 lbs. in weight. The principal fishing grounds for this important fish are Recherche, Wedge Island, and Adventure Bay. The individual fishes resemble the Barracouta, but may be easily recognised by their greater thickness, the much larger eyes, and the fewer detached finlets on the tail (two),—the Barracouta having usually six behind the dorsal and anal. They do not approach the surface during the day time. They are always captured during the night, at varying depths from the surface to ten fathoms deep—the bait usually being horse-mackerel or barracouta.

The jaws of the Kingfish are also very formidably armed with strong, long teeth, and they are so voracious that the fishermen are obliged to use strong barbless hooks which are immediately attached to an iron chain and swivel. Even this strong line has been at times insufficient for these powerful fish: recently a large individual was captured, which, when its stomach was opened, disclosed a chain, swivel, and hook, which it must have swallowed some time previous to capture. At the time when it was taken it appeared to be a strong, healthy fish. The Kingfishes do not appear during each season in equal numbers. A few years ago they were to be found entering the bays and inlets towards the mouth of the Derwent in such vast numbers that they were stranded by tons on the long shallow sandy beaches. At such times immense numbers were taken and sold for manure to hop-planters and others. Recently they have not appeared in such numbers, but no satisfactory reason can as yet be assigned for the irregularity of their appearance in this respect. Some reason has been advanced to show that they follow the main body of the Horse-mackerel, which approaches our shores from the south-west, going in a northerly direction. When these shoals of Horse-mackerel are in greatest abundance they are followed by the Kingfish and other enemies in corresponding numbers. Their migratory movements, when better understood, may explain the irregularities which are for the present inexplicable. The Kingfish, although it averages from 12 to 14 lbs. weight, sometimes reaches a weight of 20 lbs. The usual price in the market is 5*s*. per dozen. When abundant they are largely exported.

Professor M'Coy has described another species, termed by him also "The Tasmanian Kingfish" *(T. micropus.)* It must be extremely rare, however, for I have never seen a specimen, and so far as our local fishermen observe, they are not aware of a second species of Kingfish.

## SCOMBRIDÆ.

The family has been divided by some authors into two, under the names *Nomeidæ* and *Cyttidæ*. It includes the following fishes:—

| | |
|---|---|
| 1. The English Mackerel.. | *Scomber Australasicus*, Cuv. & Val. |
| 2. The Tunny............ | *Thynnus thynnus*, L. |
| 3. The Pilot Fish ......... | *Naucrates ductor*, L. |
| 4. The Sucking Fish ...... | *Echeneis remora*, L. |
| 5. The John Dorey ...... | *Zeus faber*, L. |
| 6. The Bastard John Dorey | *Cyttus Australis*, Rich. |
| 7. The Butterfly Fish .... | *Gasterochisma melampus*, Rich. |

The English Mackerel is seen on the East Coast, occasionally in large numbers, each year, moving in a northerly direction. There are few regular fishermen on the East Coast, however, and little is locally known of the habits of these fishes. They have been known to enter the estuary of the Derwent in large numbers as far as Bridgewater, but, owing to the absence of proper means for capturing them, they rarely find their way to the market. This statement also applies to the Bastard John Dorey *(Cyttus Australis)*, which is rarely captured, although during the month of May it has been known to enter the estuaries of the Derwent and Tamar in considerable numbers. I am satisfied that the local fishermen have not the proper appliances for the capture of this valuable fish. I suppose a trawl-net is best adapted for their capture, but these nets are not employed here.

The other members of the family enumerated above are only caught at odd times around the coast, and do not affect the market supply. I am doubtful, however, whether the *Zeus faber*, *i.e.*, the true John Dorey, is to be found in Tasmanian waters. It is recorded from Tasmania by Dr. Günther, but it must be exceedingly rare, for I have never seen a specimen.

### CARANGIDÆ.

This is a very important family of fishes in Tasmanian waters. It includes the following valuable food fishes:—

| | |
|---|---|
| The Horse Mackerel...... | *Trachurus trachurus*, Cuv. and Val. |
| The White or Silver Trevally | *Caranx Georgianus*, Cuv. and Val. |
| Port Jackson Kingfish .... | *Seriola Lalandii*, Cuv. and Val. |
| Tasmanian Yellow-tail .... | *Seriola grandis*, Cast. |
| Snotgall Trevally ........ | *Neptonemus brama*, Günth. |
| Mackerel Trevally........ | *Neptonemus dobula*, Günth. |
| Port Jackson Snotgall .... | *Neptonemus travale*, Cast. |
| Skipjack................ | *Temnodon saltator*, Bl. |

The four most important as regards the market, are—The Horse Mackerel, the White or Silver Trevally, the Snotgall Trevally, and the Mackerel Trevally.

The first, the Horse Mackerel, occurs in these waters in vast numbers. The young are seen all round the bays of the upper waters of the Derwent during the autumn. The mature fish are in fair esteem in the market, but the fishermen are prevented from extending the 'catch' of these numerous fishes because of the limited demand. They are not exported. The young appear to form the chief prey of the Kingfish *(Thyrsites Solandri).*

The Silver Trevally are very much prized for food, and are caught at times in considerable quantities in the Tamar and at South Arm during the autumn. Although it is said that they grow to a considerable size, the smaller ones are alone seen in local markets. They are caught by graball and seine, as a rule, but they take bait readily, and may be caught with hook and line. They are extremely pretty, silvery fish, with a barbed keel along each side towards the tail.

The Snotgall Trevally *(Neptonemus brama),* although inferior in quality to the Silver and Mackerel Trevally, from its greater abundance and size is of much greater importance as regards the general market supply. The young enter the upper waters of the Derwent, and are caught by rod and line from the jetties and wharves about Hobart in considerable numbers during the months of March and April. The Snotgall is better flavoured when it is under one pound in weight. The larger individuals are coarser, and are found towards the mouths of estuaries, in deep water. They are frequently found from two to two feet six inches long, and at this size would average twelve to fourteen pounds in weight. They are taken with hook and line, without a sinker, and are thus caught sometimes in very large quantities. They are sold in the market at rates averaging from 8*s.* to 12*s.* per dozen for 12 lb. to 14 lb. fish, and are exported in considerable quantities to Victoria, where the larger fish appear to be in greater favour than in the local market.

The Mackerel Snotgall or Trevally *(Neptonemus dobula,* Günth.) seldom reaches a length of twelve inches, is more elongate for its size than the last species, and is esteemed a greater delicacy for the table. Unfortunately, although appearing in the estuary of the Derwent during March and April in considerable numbers in certain years, they are not always to be depended upon. They mysteriously appear and disappear. This season they have been captured in considerable numbers, with the more common species, around the jetties and wharves; but it is stated that it has been upwards of four years since they were last seen in the same estuary. Their migratory habits are not very well known. The other members of the family are seldom seen in Tasmanian waters, and are therefore unimportant.

### GOBIDÆ, PEDICULATI, BLENNIDÆ, SPHYRÆNIDÆ, ATHERINIDÆ.

There are fourteen species in Tasmanian waters which belong to the above families, which include the Gobies, the Hand Fishes, the Blennies, the Silver-bellies, and the Tasmanian Jack or Pike. With the exception of the last named, which is rarely captured, they are all small fish; and, although some of them are peculiarly interesting from a naturalist's point of view, they are of no value whatever in the fish market. They may therefore be ignored in this general sketch.

### MUGILIDÆ. *The Gray Mullet Family.*

There are only two representatives of the Mullet Family known to exist in Tasmanian waters; viz.—

| | |
|---|---|
| The Sand Mullet.. | *Mugil cephalotus*, Cuv. and Val. |
| The Sea Mullet .. | *Agonostoma Forsteri*, Bl. |

The first of these is found principally towards the north-east of Tasmania (the Scamander and George's Bay), and is very highly prized in the market. It attains a much greater size than the following species; but its distance from the chief towns is sufficient to account for its great scarcity in the market, where it always commands a good price.

The Sea Mullet is caught in the shallow bays of the upper waters of estuaries, particularly those of the Derwent and Tamar, in very large numbers. In the latter river the young ascend regularly as far as the Cataract Bridge, Launceston, every year, about the months of November and December, when they are caught in large numbers by amateur fishermen with the rod and line. It is supposed that they follow the ordinary shoals of prawns which are then found in myriads in the fresh water of the North Esk and in the Tamar. It is most probable that these young fish linger near the spawning beds in the lower salt-water flats until about the time of the appearance of the prawns, and then ascend into the upper fresh-water flats along with them.* The supposed spawning grounds in the Derwent are situate above Hobart,—viz., Prince of Wales' Bay, Cornelian Bay, Lindisferne Bay, and the various sheltered mud-flats between these points and Bridgewater.

On a holiday hundreds of pleasure seekers may be seen between Bridgewater and Hobart with rod and line,—the chief attraction being Mullet-fishing. The favourite spots between these points on the Derwent appear to be Risdon, Flat Rock, Elwick Jetty, Berriedale, Triffitt's, Austin's Ferry, and Bridgewater. These points, too, are frequented by enthusiastic anglers all the year round. It is no uncommon occurrence for a single angler at these places to land four to six dozen fish, averaging ¾ lb. weight. Occasionally individuals are caught reaching 1¾ lbs. Prior to the closing of the River Derwent above Hobart for the protection of the introduced Salmonoids, the indiscriminate use of seine-nets almost destroyed the fish in these upper waters. From the evidence of old anglers it appears to be certain that, since the closing of the river, all fish have rapidly increased in numbers, size, and quality; the ruthless destruction of young fry on the nursery grounds has ceased; and it is affirmed with confidence that more fish are now caught with rod and line alone than could be got by sweeping the bays with the seine-net prior to its prohibition in this part of the river. It is also worthy of note that the class who principally fish in these upper waters are tradesmen, to whom the fish caught are a most welcome addition to the household fare. The fish measure, on the average, 8 to 12 inches long, has two dorsal fins, the first considerably in advance of the second, composed of four spines. Otherwise, the fish has a remarkable general resemblance to the Herring; and on this account it is frequently called by that name in New Zealand, where it also seems to be abundant. Dr. Günther states, in respect of other members of this family, that, if attention were paid to their cultivation, great profits could be made by fry being transferred into suitable backwaters on the shore, in which they rapidly grow to a remarkable size. Local advantage might be taken of this suggestion.

## CENTRISCIDÆ, GOBIESOCIDÆ.

The only fishes belonging to these families are—

---

* Dr. Günther states that their food consists of organic substances contained *in mud or sand*,—their organs of the pharynx being well *adapted for filtering the mud* or sand which they partially swallow.

| | |
|---|---|
| The Bugler or Trumpeter.. | *Centriscus scolopax*, L. |
| Another species, known as . | *Crepidogaster Tasmaniensis*, Günth. |

They are of no value for food, and are very scarce. The first named fish is also called "Bellows Fish," from its singular resemblance to that instrument. The snout is produced into a long tube.

### TRACHYPTERIDÆ. *The Ribbon Fish Family.*

Two representatives of this remarkable family of fishes exist in Tasmanian waters ; viz.:—

| | |
|---|---|
| The Ribbon Fish ........ | *Regalecus gladius*, Cuv. and Val. |
| Spotted ditto .... .... . | *Trachypterus altivelis.* |

A specimen of the first named, *R. gladius*, was captured on the shore near the Penguin about 3 years ago, which measured 14 feet long. It was afterwards exhibited in Launceston and Hobart as "The Sea Serpent"—its mane-like rays over the head, and its extraordinary length, giving common favour to this idea. The Spotted Ribbon Fish caught recently at Spring Bay, *T. altivelis*, is a smaller fish, but so extremely thin and transparent that it has been preserved by laying it flat upon a paper surface, after the manner of ordinary mounted seaweed. Dr. Günther states with respect to these singular fishes, that when they "reach the surface of the water the expansion of the gases within their body has so loosened all parts of their muscular and bony system that they can be lifted out of the water with difficulty only, and nearly always portions of the body and fins are broken and lost."

### GADIDÆ. *The Cod Family.*

This is a most important family of fishes as regards market supply; although it only comprises two species in these waters—

| | |
|---|---|
| Bull-kelp Cod ........... | *Lotella Swanii*, Johnston ; |
| Rock Cod—Cape Cod .... | *Pseudophycis barbatus*, Günth. ; |

the individuals of one of these, *P. barbatus*, "Rock-cod," exist in such wonderful abundance that they are captured during a portion of the year in quantities far exceeding the local demand. They are caught in moderate numbers all the year round, although their season for a variety known to fishermen as the Deep-water, or Cape-cod, is from May to September. It would appear that the latter is simply the mature form of the "Rock-cod," which enters the upper waters of estuaries in vast numbers during the month of May. Certain shallow banks seem to be favourite localities, probably because their food—small squids and crustaceans—exist in such places in great abundance. There is one minute pretty colored pea-shaped crab which seems to be eagerly sought after by them, for during capture large numbers of these tiny crustaceans drop from their capacious mouths while unhooking them. Their numbers entering estuaries during different seasons vary to a remarkable degree. It is not easy to account for this, but it has been noticed that they are most abundant when the "brit" and other crustaceans appear in greatest numbers. It is quite conceivable, therefore, that the seasonal variation of temperature and meteorological conditions may determine to a great extent the development of the small crustaceæ, and through them regulate the natural increase of the Rock-cod and other fishes which so largely subsist upon them. The Rock-cod rarely exceeds 2½ lbs. weight, although its appearance would be apt to lead one to suppose that the ordinary mature individuals are at least double this weight. The prevailing colour is tawny brown on back, creamy or pinkish-white on belly. The dorsal has only two divisions, the anterior one composed of from 9 to 11 soft simple rays. The flesh is rather soft, but it is held in fair esteem as food. It will cure well. When smoked with cedar sawdust they are highly prized. It is stated by experienced fishermen that if greater care were taken in the modes of smoking and curing, our fish would be held in much greater esteem. As the Rock-cod may be caught during the season in quantities far exceeding local demand, it would be well if greater attention were paid to the preservation of this fish, and so secure a wider market.

### OPHIDIIDÆ. *Ling Family.*

There are two members of this family in Tasmanian waters; viz.:—

| | |
|---|---|
| The Ling................ | *Genypterus Australis*, Cast. *(blacodes?)* |
| Ditto ................ | *Fierasfer Homei*, Rich. |

The first of these is alone important as regards the market supply. These fish usually are captured on a weedy or rocky bottom, in from 3 to 8 fathoms water, with hook and line. The average weight is about 7 lbs., but individuals are known to reach a weight of 15 lbs. They are sometimes captured on the surface. It would appear that if in pursuit of prey they happen to breach on the surface, they rupture the air-bladder or sustain some other injury. They are held in fair esteem in the market, but are only caught in numbers at odd times, and therefore cannot be much depended upon.

The second species, *Fierasfer Homei*, Rich., is rarely captured.

### PLEURONECTIDÆ. *Flat Fish Family.*

There are four members of this family stated to exist in Tasmanian waters, but only two are found abundantly. These are—

| | | |
|---|---|---|
| 1. | The Sole of fishermen . | *Amnotretis rostratus*, Günth. |
| 2. | The Flounder ........ | *Rhombsolea monopus*, Günth. |

These fishes are generally taken in the shallows of estuaries and along the sandy coasts, by seine-nets. They are among the most highly prized fishes for the table, and are taken in considerable quantities all the year round. They are rarely caught with hook and line. There is a law in existence prohibiting the sale of Flounders under 9 inches, but it would appear from the evidence of various fishermen that the law is evaded to a very great extent. From the evidence of Mr. Barnett it would appear that the individuals brought to the Hobart market are much below the size formerly captured, and he attributes this to overfishing. It would seem to be impossible to regulate the mesh of the seine so as to allow the escape of the young fry of flounders and other important food fishes, and large numbers are destroyed either through wanton carelessness in not immediately returning undersized fish to the water, or because they are actually destroyed by the drawing of the seine-net.

As the use of the seine needlessly destroys young fish far out of proportion to the few captured, its use should be confined to particular localities. It is perhaps difficult to devise a better mode for the capture of certain fish now principally obtained by seine-nets, but it is undoubtedly a barbarous engine of destruction, and it would be of the greatest service if some improvement could be devised which would have the effect of rendering it less destructive to the young fry on the nursery grounds. In the meantime, where there are no naturally protected nursery grounds, such as exist among the snags of the Nelson shoals on the Tamar, the only alternative would be to close particular localities in estuaries so far as the use of the seine-net is concerned.

During former years the Flounder was much more abundant in the waters of the Tamar and Derwent; but, until recently, when they appear again to be on the increase, their numbers fell off so much that it was hardly profitable to search for them. It was reasonable to assign this decrease to the indiscriminate use of the seine-net, and the partial closure of the two rivers may have something to do with their reappearance in great numbers. It must be granted, however, that other causes unknown may have also operated together with those assigned.

### SCOMBRESOCIDÆ. *Garfish Family.*

There is only one species belonging to this family known to exist in Tasmanian waters; viz.—

The Garfish ............ *Hemirhamphus intermedius*, Cast.

It is found in great abundance in the shallow waters in estuaries during the summer months, and is most highly esteemed in the market. It does not ascend within the influence of the fresh water so freely as the other migratory fishes, and its capture by seine-net is not affected by the closing of the upper waters of estuaries. There is a good demand for all the Garfish brought to market, and they usually fetch a price from 4*d.* to 9*d.* per dozen. The fish may be captured at any time between April and October. The mesh of the seine-net used in its capture usually measures a quarter of an inch from knot to knot.

### GONORHYNCHIDÆ.

There is only one member of this family known locally; viz.:—

The Sand Eel ............ *Gonorhynchus Greyi*, Rich.

It is rarely captured, however, and is therefore of little interest from a commercial point of view.

### HOPLEGNATHIDÆ.

There is only one representative of this family said to exist in our waters, viz., *Hoplegnathus Conwayii*, Rich.; but it is rarely taken, and is of little importance.

### LABRIDÆ. *The Parrot Fish Family.*

There are nine representatives of the Parrot Fish family in Tasmanian waters, of which the following are the most common:—

| | |
|---|---|
| 1. Blue Groper | *Cossyphus Gouldii*, Rich. |
| 2. Parrot Fish | *Labrichthys bothryocosmus*, Rich. |
| 3. Purple Parrot Fish | *Labrichthys fucicola*, Rich. |
| 4. Banded Parrot Fish | *Labrichthys laticlavius*, Rich. |
| 5. The Ground Mullet or Kelp Fish | *Odax balteatus*, Cuv. & Val. |
| 6. The Stranger | *Odax Richardsoni*, Günth. |

The first and last of these seem to be the only members of the family that are held in any degree of favour as food. Fishermen however state that, although not in favour, they are all good for food. It is stated that the Blue Groper, though little appreciated, is exceedingly good. In the Report of the Royal Commission on Fisheries of New South Wales, it is recorded that the head of this fish makes the most delicious dish one can well conceive. The Blue Groper is uniformly dark purplish; the upper profile of head bent downwards in a regular curve; caudal fin truncated; four anterior canine teeth in each of the jaws, sometimes reaching a length of from thirty-nine to forty-two inches. The Stranger is caught occasionally in the upper waters of the estuaries of the Derwent; is in fair esteem for the market,—though, as its name implies, it is only obtained occasionally. It is of a curiously elongate shape, like the Pike, snout produced, body and fins marbled, and streaked with faint yellow. The other members of the family are noted for the beauty of their colours. They invariably feed upon shell-fish, their jaws being well armed for this purpose. The most of them have very thick lips and strong canine teeth. The colours in some of the species vary considerably; and it is possible that this feature may have led classifiers astray in some cases.

### CLUPEIDÆ. *The Herring Family.*

Of this important family of fishes there are only three species known to exist in Tasmanian waters; viz.—

| | |
|---|---|
| The Anchovy | *Engraulis encrasicholus*, var. *Antipodum*, L. |
| The Sprat | *Clupea sprattus*, L. |
| The Pilchard | *Clupea sagax*, Jenyns. |

The two former exist in our waters in vast shoals, and form the prey of the Barracouta, Mackerel, and other fishes. They sometimes ascend into the upper waters of the estuaries of the Derwent and Tamar; and occasionally they *have been known* to have stranded themselves in millions *while pursued* by their natural enemies. No attempt has yet been made to make use of these fishes in Tasmania. No doubt attention will in time be drawn to this valuable source of wealth. At present there are no proper means among us for their capture; their migratory habits are little understood; and there are no establishments in our midst for preserving them. It is not creditable to local enterprise that this source of wealth should have remained so long without an attempt being made to utilise it.

It is unfortunate that our waters should not also contain the *Clupea harengus*, the Common Herring of European waters. The successful introduction of various species of *Salmonidæ* into our rivers from Great Britain gives hope that the Herring may also be introduced. There are great difficulties in the way, but they may in time yield before improved means of transit; and it is not impossible that we may yet see our southern waters the home of this, the most useful of all food fishes.

### MURÆNIDÆ. *The Eel Family.*

There are four representatives of this family in Tasmanian waters, but there are only two of them important as regards the market supply; viz.—

| | |
|---|---|
| The Common Eel ...... | *Anguilla Australis*, Rich. |
| The Conger Eel ........ | *Conger vulgaris*, Cuv. |

The first of these is referred to under the heading "Freshwater Fishes."

The Conger Eel is brought to market in considerable quantities, and is largely exported. They are caught all the year round, and are sold at a very low price. They vary greatly in size, and weigh from 7 to 50 lbs. They are chiefly taken by hook and line.

### PEGASIDÆ, SYNGNATHIDÆ, SCLERODERMI, GYMNODONTES.

The fishes belonging to the above families number twenty-seven species in Tasmanian waters, and include the Pipe Fishes, Sea Dragon, Sea Horses, Leather Jackets, Globe Fishes, Porcupine Fish, Sun Fishes. With the exception of certain individuals of the Leather Jacket Family, there are none of them of any marketable value, and need not engage our attention. The Leather Jackets are singular fishes, with a single erectile, barbed or toothed, dorsal spine, a coarse granular skin, and having wonderfully strong *jaws armed with* sharp cutting teeth. Some of *them are said to be very good* for the table when skinned;

but they are not held in esteem in the market, and consequently they are seldom seen there.

### CHONDROPTERYGII. *Sharks and Rays.*

The following is a list of this group, so far as known to exist in Tasmanian waters:—

| | |
|---|---|
| *Callorhynchus antarticus*, Lacep. | The Elephant Fish. |
| *Carcharias glaucus*, L. | The Blue Shark. |
| *Galeus canis*, Rondel | The Tope, or School Shark. |
| *Zygæna malleus*, Shaw | The Hammer-headed Shark. |
| *Mustelus antarticus*, Günth. | Smooth-head. |
| *Lamna cornubica*, Flem. | Porbeagle or Blue Shark. |
| *Odontaspis Americanus*, Mitch. | The Grey Nurse. |
| *Alopecias vulpes*, L. | Thrasher. |
| *Notidanus indicus.* | |
| *Scyllium maculatum* | Spotted Sea Snake. |
| *Scyllium laticeps* | The Sea Snake. |
| *Parascyllium variolatum*, Dum. | |
| *Crossorhinus barbatus*, L. | Wobbigong. |
| *Heterodontus Phillipii*, Lacep. | Port Jackson or Bull-head Shark. |
| *Acanthias vulgaris*, Risso. | Spotted Spiny Dog. |
| *Acanthias Blainvillii*, I. | Spiny Dog. |
| *Rhina squatina*, L. | The Angel Shark. |
| *Pristiophorus cirratus*, Latham | Saw-fish. |
| *Pristiophorus nudipinnis*, Günth | Saw-fish. |

None of these fishes are used as food in Tasmania, although the Dog Fishes are very abundant. Certain of them (*Galeus canis*) are captured, and the livers boiled down for oil. The fins of this shark are also exported for the preparation of isinglass. It is affirmed by the fishermen that the use of deep-sea lines would be valueless here on account of the vast number of destructive Sharks.

### TORPEDINIDÆ.

There are four members of this group known in Tasmanian waters, which include the Electric Torpedo, the Thorn Back, and the Stingaree. They are not of any value, however, and may be ignored.

# CLASSIFIED CATALOGUE

OF

# THE FISHES OF TASMANIA.

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## SUB-CLASSES AND ORDERS.

### SUB-CLASS I. Teleostei.

Fishes with a bony skeleton and completely separated vertebræ; the posterior extremity of the vertebral column either long or covered with bony plates. Bulb of the aorta simple, with two opposite valves at the origin; branchial free.

ORDER I. *Acanthopterygii.* (*Type*, Trumpeter.)

Some of the rays of the dorsal, anal, and ventral fins not articulated, forming spines; the inferior pharyngeal bones separated. Air-bladder, if present, without pneumatic duct. (Families 1 to 22.)

ORDER II. *Acanthopterygii Pharyngognathi.* (*Type*, Parrot Fish.)

The inferior pharyngeal bones are coalesced, with or without a medium longitudinal suture. Part of the rays of the dorsal, anal, and ventral fins not articulated, forming spines. (Family 23.)

ORDER III. *Anacanthini.* (*Type*, Flounder and Sole.)

Vertical and ventral fins (except in *Gadopsis*) without spinous rays. The ventral fins, if present, are jugular or thoracic. Air-bladder, if present, without pneumatic duct. (Families 24 to 28.)

ORDER IV. *Physostomi.* (*Type*, Salmon and Herring.)

All the fin rays articulated: only the first of the dorsal and pectoral fins is sometimes more or less ossified. The ventral fins, if present, are abdominal, without spine. Air-bladder, if present, with a pneumatic duct. (Families 29 to 38).

ORDER V. *Lophobranchii.* (*Type*, Sea-horse.)

The gills are not laminated, but composed of rounded lobes, attached to the branchial arches. Gill-cover reduced to a large simple plate. Air-bladder simple, without pneumatic duct. A dermal skeleton. (Families 39 and 40.)

ORDER VI. *Plectognathi.* (*Type*, Leather-jacket: Toad-fish.)

Teleosteous fishes, with rough scales, or with ossifications of the cutis in the form of scutes or spines; skin sometimes entirely naked. Skeleton incompletely ossified, with the vertebræ in small number. Gills pectinate; a narrow gill-opening in front of the pectoral fins. Mouth narrow; the bones of the upper jaw generally firmly united. A soft dorsal fin, belonging to the caudal portion of the vertical column, opposite to the anal: sometimes elements of a spinous dorsal besides. Ventral fins none, or reduced to spines. Air-bladder without pneumatic duct. Nearly all are marine fishes. (Families 41 and 42.)

## SUB-CLASS II. Chondropterygii. *(Sharks and Rays.)*

Skeleton cartilaginous; skull without sutures. Body with medial and paired fins, the hinder part abdominal; caudal fin with produced upper lobe. Gills attached to the skin by the outer margin, with several intervening gill-openings: rarely one gill-opening only. No gill-cover. No air-bladder. Three series of valves in the bulbus arteriosus. Intestine with a spiral valve. Optic nerves commissurally united, not decussating. Ovaries with few and large ova, which are impregnated, and, in some, developed internally. Embryo with deciduous external gills. Males with prehensile organs attached to the ventral fins.

### ORDER 1. *Holocephala.* *(Type,* Elephant Fish.)

One external gill-opening only, covered by a fold of the skin, which encloses a rudimentary cartilaginous gill-cover; four branchial clefts within the gill-cavity. The maxillary and palatal apparatus coalescent with the skull. (Family 43.)

### ORDER II. *Plagiostomata.* *(Type,* Hammer-shark: Tope: Dog-fish: Skate.

From five to seven gill-openings. Jaws distinct from skull. (Families 44 to 56.)

## SUB-CLASS III. Cyclostomata. *(Type,* Lamprey.)

Skeleton cartilaginous and notochordal, without ribs and without real jaws. Skull not separate from the vertebral column. No limbs. Gills in the form of fixed sacs, without branchial arches, six or seven in number on each side. One nasal aperture only. Heart without bulbus arteriosus. Mouth anterior surrounded by a circular or sub-circular lip: suctorial. Alimentary canal straight, simple, without cæcal appendages, pancreas, or spleen. Generative outlet peritoneal. Vertical fins rayed. (Family 57.)

## SUB-CLASS IV. Leptocardii. *(Type,* Lancelet.)

Skeleton membrano-cartilaginous and noto-chordal, ribless. No brain. Pulsating sinuses in place of heart. Blood colourless. Respiratory cavity confluent with the abdominal cavity: branchial clefts in great number, the water being expelled by an opening in front of the vent. Jaws none. (One Family only known, No. 58.)

## EXPLANATION OF TERMS, &c.

*Terms relating to the Head.*

*Snout.*—The upper part of head situate in front of eyes.

*Occiput.*—The hinder part of the head or skull.

*Gill-cover.*—Consists of four broad flat bones joined together on each side of the head. The anterior with vertical free margin is called the *præ-operculum;* the upper posterior bone, the *operculum;* the lower posterior bone, the *sub-operculum;* and the bone forming the base, the *inter-operculum.*

*Gill-opening.*—The vertical opening or *slit* leading to respiratory organs,—the gills.

*Branchiostegals.*—The bony rays supporting the membrane or cover to the gill-opening.

*Maxillary.*—The second bone of upper jaw, often flat and inflated, and sometimes armed with teeth. The *inter-maxillary* or *præ-maxillary* is the anterior bone of upper jaw.

*Mandibles.*—The bones of lower jaw.

*Vomer.*—The thin bone over roof of mouth dividing nostrils, the base sometimes armed with teeth.

*Palatines.*—Bones situate on either side of vomer, the base sometimes armed with teeth.

*Terms relating to the Body.*

The body is composed of *head* and *trunk.* It is *compressed* and *elevated* when it is flattened laterally, as in the Bastard Dorey. It is *depressed* when flattened vertically, as in the Skate. It is *elongate* when shaped like the Salmon. The narrow extremity of tail is termed the *peduncle.*

The *Lateral line* is the median line along the sides of certain fishes formed by a series of pierced scales. The latter are sometimes interrupted, and may be in one or more rows longitudinally.

*Terms relating to the Fins.*

Usually there are two "paired" fins on fishes, corresponding to, or, as they are termed, the *homologues* of the fore and hind limbs of the higher *vertebrates.* The first pair *(pectoral),* when present are situate under the shoulder, close to gill-opening. The second pair *(ventral)* are variously placed,—under the chin they are *jugular;* under pectoral, or shoulder, *thoracic;* behind shoulder, *abdominal.* The following are unpaired:—The *dorsal* fin or fins are situate on the median line of the back; the *anal* on the median line between *vent* and *caudal* fin; the *caudal* is placed vertically on the extremity of vertebræ or tail. When the latter is deeply notched, it is *forked* or *furcate;* when margin is concave, *emarginate;* convex, *rounded;* straight, *truncate.*

*Finlets.*—Small detached rudimentary fins situate behind the dorsal and anal fins, as in the Barracouta.

*Terms relating to the Fin Rays.*

The fins are either rayless, when composed of a simple fatty integument or skin *(adipose),* or the membrane is supported by fine or stout rays, composed of bone or cartilage.

When the rays are solid and jointless they are termed *spines*; when they are jointed they are *articulate*, and are termed *soft rays*. The latter are either *branched* or *simple*; when the branch is divided at the base it is said to be Y-shaped, and is counted as one ray.

*Terms relating to the Teeth.*

Teeth are sometimes arranged in bands and patches, or in single or in many series, and may be found on mandibles, maxillaries, vomer, palatines, or tongue; or they may be *absent* in one or all of the situations named. They are *villiform* when very fine, or minute conical teeth arranged in a band; *setiform* shaped, like a bristle; *granular*, small molar teeth; *incisors*, front cutting teeth; *canines*, large projecting dog-like teeth; *pavement-like*, as in certain of the sharks.

*Terms relating to the Scales.*

Margins simple, *cycloid*; margins serrated or toothed, *ctenoid*; scales with hardened plates of bony enamel, *ganoid*; scales modified into spines, *scutes*.

*Abbreviations.*

* Edible fish. ** Principal edible fish forming market supply.

(A.) Common to Australia and Tasmania. (Z.) Inhabits New Zealand.

(A.Z.) Common to Australia, Tasmania, and New Zealand.

(T.) Peculiar to Tasmania. (E.) Found also in the waters of the Northern Hemisphere. (I.) Introduced.

B. Branchiostegals. D. Dorsal fin. A. Anal fin. V. Ventral fin. P. Pectoral fin. C. Caudal fin.

L. lat. refers to the series of scales along the lateral line.

L. tr. The series of scales transversely, counting usually from first spine of dorsal obliquely across side to vent. The · or : indicates the division and the number of scales on either side of lateral line.

- The hyphen between figures, that the characters vary to the extent indicated by the figures.

: When this sign occurs between figures, thus—D. 17 : 34, it indicates that the *dorsal* fin has two divisions, 17 rays, usually spines, in the first division, and 34 rays, usually soft *branching rays*, in second division.

· When this sign occurs between figures, thus—A. 3·9, it indicates that, although not properly separated into two divisions, the first series of rays are *spinous*, and the series after the period are soft simple or *branched rays*.

I. II. III. IV. V. VI. When Roman figures are used, thus—D. 17 : 4·12 : VI., they indicate that there are *six finlets* behind the regular divisions of the dorsal fin, as in the Barracouta.

*Cæc. pylor.* refers to the pyloric appendages, which are short, skinny, cord-like, closed tubes attached to the stomach of some fishes. In the genus *Salmo* they exist in considerable number.

# EXPLANATION OF KEY TO ORDERS AND FAMILIES.

The Key is arranged according to the branched or binary system of the French Naturalist, Lamarc. This plan has been adopted, with great success, by the late Rev. W. W. Spicer, M.A., in his "Handbook of the Plants of Tasmania."

The method consists of a series of pairs of characteristic descriptions so arranged that the student, by commencing with the first pair, is led, by the acceptance always of one out of two propositions, to the next pair by the aid of numbers, which correspond with consecutive index numbers to the several pairs of the descriptive propositions. This course is pursued until the student is finally brought to the *Family* number, which, for distinction, is printed in Roman characters. By turning to the corresponding number in Classified Catalogue, the student may easily find the particular genus and species by means of the symbolic and abbreviated characters given after the name of each species under the family.

For example : if the fish under examination be the *Hobart Trumpeter*, the student would find, under Primary Division, that it agreed with the first proposition of No. 1, which leads to pair No. 4. The examination of No. 4 would lead to the acceptance of the *second* proposition, leading to pair No. 8. It, in turn, by following a similar course, would lead to the adoption of the following, in sequence ; viz.—No. 10, the *first* leading to No. 11 ; No. 11, the *first* leading to No. 12 ; No. 12, the *second* leading to No. 15 ; No. 15, the *first* leading to No. 16 ; No. 16, the *first* leading to No. 17 ; No. 17, the *second* leading to No. 18 ; No. 18, the *first* leading to No. 19 ; No. 19, the *second* terminating in CIRRHITIDÆ—VI. If we now turn to that family in the Classified Catalogue, we would find that the number of spinous and soft rays in Dorsal, Anal, and Pectoral (viz.—D. 17 : 1·36 - 38. A. 3·28 - 30. P. 9·8 - 9.) would finally lead to the true name of species, viz., *Latris hecateia*, Rich.—The Trumpeter.

A little practice will enable any person of ordinary intelligence to determine any of the known Tasmanian fishes by this method.

# KEY TO THE ORDERS AND FAMILIES.

## PRIMARY DIVISIONS.

1. Fishes with a bony skeleton.
Gills free, with one opening on each side; caudal symmetrical, or absent. Teleostei. 4.

„ Fishes with a membranous or cartilaginous skeleton.
Gills attached, with several openings. 2.

2. Skeleton cartilaginous. 3.

„ Skeleton membranous.
Eye rudimentary; mouth a longitudinal fissure. Leptocardii. 67.

3. Body eel-like; mouth circular, suctorial. Cyclostomata. 67.

„ Body shark-like; caudal unsymmetrical. Chondropterygii. 9.

## NATURAL ORDERS.

4. All the fin rays soft, articulated.* 5.

„ Portion of the fin rays spinous, not articulated. 8.

5. Gill-openings more or less wide, one on each side; body scaly or smooth. 6.

„ Gill-openings reduced to narrow slits, usually situated in front of pectoral fins; body with osseous rings, or skin covered with scutes or spines; never scaly. 7.

6. Ventral fins, if present, jugular or thoracic. Anacanthini. 41. (*Type*, Flounder.)

„ Ventral fins, if present, abdominal. Physostomi. 44. (*Types*, Salmon; Herring.)

7. Gill-cover reduced to a large simple plate; body composed of osseous rings. Lophobranchii. 52. (*Type*, Sea Horse.)

„ Gill-opening a narrow slit in front of pectorals; body with rough scutes or spines. Plectognathi. 52. (*Types*, Leather Jacket; Toad Fish.)

8. Inferior pharyngeal bones separated. Acanthopterygii. 10. (*Type*, Trumpeter.)

„ Inferior pharyngeal bones coalesced with or without a median longitudinal suture. Acanthopterygii-Pharyngognathii. 53. (*Type*, Parrot Fish.)

9. External gill-opening, one covered by a fold of the skin, jaws coalescent with the skull. Holocephala. 54. (*Type*, Elephant Fish.)

„ External gill-openings five to seven; jaws distinct from skull. Plagiostomata. 55. (*Types*, Hammer Shark; Dog Fish; Skate.)

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* In this group is included certain fishes, like the Salmon, whose first ray of dorsal and pectoral is sometimes more or less ossified.

## FAMILIES.

10. No adhesive disc between the ventrals. 11.
„ An adhesive disc between ventrals. Gobiesocidæ—XX.

11. Ventrals thoracic. 12.
„ Ventrals jugular or abdominal. 33.

12. Spinous dorsal *greater* than the soft. 13.
„ Spinous dorsal nearly *equal or less* than the soft. 15.

13. One dorsal fin, or if more, with divisions continuous. 14.
„ Dorsal fins, two, separate.

14. *Teeth feeble; scales none, or minute;* body compressed; eyes lateral; suborbital ring articulated with the P.O.; B. 5-7. Triglidæ, part (Scorpænidæ)—VII.
„ *Teeth several, long, and strong in jaws;* cleft of mouth wide; body elongate, compressed; naked, or with minute scales; D. and A. elongate, sometimes with finlets; C. distinct; V. sometimes rudimentary; B. 7-8. Trichuridæ—X.

15. Spinous dorsal *nearly as long* as the soft. 16.
„ Spinous dorsal shorter than soft. 22.

16. One dorsal fin, or if more, with divisions continuous. 17.
„ Dorsal fins, *two*, separate; 16 A.; two long barbels under chin; body elongate, covered with large scales. (Upeneichthys porosus.) Mullidæ—III.

17. Teeth trenchant in front of the jaws or lateral series of molar teeth. Sparidæ—IV.
„ Teeth not so constructed. 18.

18. Scales cycloid or rudimentary. 19.
„ Scales finely ciliated or ctenoid. 21.

19. Teeth small, in villiform bands on jaws; some on palate. 20.
„ Villiform teeth on jaws; none on palate; lower pectoral rays simple, and generally stout. Cirrhitidæ—VI.

20. Head and præoperculum armed; scales sometimes rudimentary. Triglidæ, part (Scorpænidæ)—VII.
„ Head normal; præoperculum often serrated. Percidæ, part—II.

21. Anal rays 3 · 9; spines of fins very strong; at inferior limb directed forwards. Percidæ, part—II.
„ Anal with about 27 soft rays; body compressed, elevated; jaws with an outer series of stronger teeth. The soft dorsal armed, anal falcate, the former covered with scales; uniform brownish. B. 7. D. 9 · 26. A. 3 · 27. (Scorpis Georgianus) Squamipinnes—V.

22. One dorsal fin, or if more, with divisions continuous. 23.
„ Two dorsal fins, separate. 29.

23. A posterior canine tooth present. Labridæ—XXIII.
„ Without canine teeth. 24.

24. Three free pectoral rays; head cuirassed. Triglidæ, part —VII.
„ *Pectorals normal*; head not cuirassed. 25.

25. No caudal fin. TRACHYPTERIDÆ—XXI.
„ Caudal fin present. 26.

26. Spines on each side of tail. CARANGIDÆ, part—XII.
„ Otherwise constructed. 27.

27. Ventrals with more than five soft rays; opercular bones armed with two distinct spines; scales ctenoid. B. 8 or 4. BERYCIDÆ—I.
„ Ventrals with five soft rays. 28.

28. Caudal rounded; body compressed and much elevated. B. 7 or 8. SCOMBRIDÆ, part—XI.
„ Caudal forked. V. 1 : 5. PERCIDÆ, part—II.

29. A papilla near vent; ventrals sometimes united. GOBIIDÆ—XIII.
„ Without papilla; ventrals not united. 30.

30. Scales ctenoid. 70.
„ Scales cycloid or absent; with or without finlets. 31.

31. Finlets absent.
  *a.* Lateral line not armed with plates; A. fin with less than twenty soft rays. SPHYRÆNIDÆ—XVI.
  *b.* Lateral line often armed with plates; two A. spines remote from soft portion; soft rays more than 20. CARANGIDÆ, part—XII.
„ Finlets present. 32.

32. Ventrals long; scales cycloid, moderate; body oblong, compressed; teeth small. SCOMBRIDÆ, part—XI.
„ Ventrals moderate; scales absent, or moderately small; teeth variable; V. sometimes rudimentary, or absent; body elongate, compressed. SCOMBRIDÆ, part—XI.

33. Ventrals jugular. 34.
„ Ventrals abdominal. 38.

34. Spinous dorsal greater than the soft; scale small, or naked; one, two, or three dorsal fins (small fish). BLENNIDÆ—XV.
„ Spinous dorsal less than the soft. 35.

35. One dorsal fin. 36.
„ Two dorsal fins. 37.

36. Ventrals of a single bifid ray; a small portion of the D. and A. formed into true spines. GADOPSIDÆ (GADOPSIS MARMORATUS)—XXIV.
„ Ventrals 1 : 5. Mouth vertical or oblique. TRACHINIDÆ, part—VIII.

37. Body frequently covered with minute spines; carpal bones prolonged, forming a sort of arm for pectorals; gill-opening reduced to a small foramen, situated in or near axil; tentacle sometimes plumose on snout. PEDICULATI—XIV.
„ Body smooth or scaly; teeth in villiform bands, sometimes with pointed and conical canines; gill-opening wide; eyes *frequently directed* upwards. TRACHINIDÆ, part—*VIII.*

38. Two dorsal fins. 39.

39. Mouth produced into a tube; body elevated; teeth, none; scales none, or small; body covered with a cuirass or with nonconfluent ossifications. (Centriscus scolopax.) Centriscidæ—XIX.

„ Mouth not produced; body not elevated. 40.

40. Spines of the first D. more than four. 40*a*.

„ First D. with four stiff spines. Mugilidæ—XVIII.

40*a*. No barbels; spines of first dorsal feeble, flexible; teeth minute; a silvery band along the side. Minute fishes. Atherinidæ—XVII.

41. Body symmetrical, with an eye on each side of the head. 42.

„ Body unsymmetrical; both eyes on the same side of the head, on the upper, which alone is coloured. Pleuronectidæ—XXVIII. (*Type*, Flounder.)

42. Ventrals thoracic; tail tapering to a fine point; no caudal. Macruridæ—XXVI. (*Type*, Ling.)

„ Ventrals jugular. 43.

43. One, two, or three dorsal fins, occupying nearly the whole of the back; one or two A. fins, with or without a barbel; caudal free, or, if united to D. and A., the dorsal has a separate anterior portion; V. with several rays. Gadidæ—XXV. (*Type*, Rock Cod.)

„ One dorsal united to caudal; no separate anterior dorsal or anal. Ophidiidæ—XXVI. (*Type*, Ling.)

44. Second dorsal composed of an adipose fin, without bony rays. 45.

„ No adipose fin present. 47.

45. Dorsal fin very elongate, occupying nearly entire length of back; opercular apparatus incomplete; oviduct present. Scopelidæ—XXX.

„ Dorsal not elongate; opercular apparatus complete; no oviduct. 46.

46. First dorsal before the vent; margin of upper jaw nearly altogether formed by maxillary; body naked, or scaly; pyloric appendages, none; minute fishes. Haplochitonidæ—XXIX. (*Type*, Freshwater Herring.)

„ First dorsal over the vent in minute species, before the vent in the larger introduced species; body covered with scales; margin of upper jaw formed by the intermaxillaries laterally; pyloric appendages generally numerous. Salmonidæ—XXXI. (*Types*, Salmon; Smelt.)

47. Body apparently scaleless. 48.

„ Body with scales. 49.

48. Dorsal short; belly rounded; vertical fins not continuous with caudal; in creeks, fresh or brackish. Galaxidæ—XXXII. (*Type*, Jollytail.)

„ Dorsal and anal long and continuous with caudal; body rounded or band-shaped; under lens the scales become apparent; no ventrals. Murænidæ—XXXVIII. (*Type*, Freshwater Eel.)

49. Mouth with barbels; scales spiny; mouth inferior; gill-opening narrow. Gonorhynchidæ—XXXV.
„ Barbels, none. 50.

50. A series of keeled scales on each side of belly; mouth terminal; lower jaw produced; dorsal opposite to anal. Scombresocidæ—XXXIII. (*Type*, Garfish.)
„ Sides not armed with keeled scales. 51.

51. Abdomen frequently compressed into a serrated edge. Clupeidæ—XXXVI. (*Types*, Anchovy; Sprat.)
„ Abdomen rounded. Freshwater fishes. Cyprinidæ—XXXIV. (*Types*, Carp; Tench; Gold Fish.)

52. Bony fishes, composed of plates or osseous rings; dorsal rays; teeth minute or absent. 68.
„ Fishes with rough scutes or spines; jaws armed with distinct teeth. 69.

53. Marine fishes, generally with brilliant colours; frequently armed with canine teeth. Labridæ—XXIII. (*Type*, Parrot Fish.)

54. One external gill-opening only; produced snout, with soft pear-shaped appendage. Chimeridæ—XLIII. (*Type*, Elephant Fish, *Callorhyncus antarticus*, Lacep.)
„ External gill-openings, 5 to 7. 55.

55. Eye with a nictitating membrane. Two dorsals and an anal. Carchariidæ—XLIV.
Eye without a nictitating membrane. 56.

56. Anal fin present. 57.
„ No anal fin. 60.

57. Two dorsal fins. 58.
„ One dorsal fin opposite anal. Notidanidæ—XLVII.

58. First dorsal above or behind the ventrals. Scyllidæ—XLVI. (*Type*, Dog-fish.)
„ First dorsal between pectorals and ventrals. 59.

59. Teeth acute. Lamnidæ—XLV.
„ Teeth obtuse. Cestracionidæ—XLVIII. (*Type*, Port Jackson Shark.)

60. Gill-openings lateral. (Sharks.) 61.
„ Gill-openings ventral. (Rays.) 63.

61. Snout much produced, with lateral saw-like teeth. Pristiophoridæ—LI. (*Type*, Saw-fish.)
„ Snout normal. 62.

62. Dorsal fins, two, without spines. Rhinidæ—L. (*Type*, Angel Shark.)
„ Dorsal fins each armed with a spine. Spinacidæ—XLIX. (*Type*, Spotted Dog-fish.)

63. Snout produced. 64.
„ Snout not produced; rounded; caudal well developed. Torpedinidæ—LIII. (*Type*, Torpedo.)

64. Snout with a detached pair of cephalic fins; spine on the tail; sides of head free from pectoral fin. Myliobatidæ—LVI. (*Type*, Whip-tail Ray.)

„ Snout otherwise constructed. 65.

65. Pectorals not extending to snout; two dorsals on tail. Rhinobatidæ—LII.

„ Pectorals extending to, or confluent at, extremity of snout.

66. Spine on tail; tail without lateral longitudinal folds. Trygonidæ—LV. (*Type*, Stingaree.)

„ Two dorsals on the tail; tail with a longitudinal fold on each side; no serrated caudal spine. Rajidæ—LIV. (*Type*, Skate.

67. Head without barbels; sometimes with pouch under throat; fresh-water. Petromyzontidæ—LVII. (*Type*, Lamprey.)

„ Cirri on each side of fissure-like mouth; marine. Cirrsotomi —LVIII. (*Type*, Lancelet.)

68. Ventral fins present. Pegasidæ—XXXIX.

„ No ventral fins. Syngnathidæ—XL.

69. The elements of a spinous dorsal and ventral fins generally present. Sclerodermi—XLI.

„ No spinous dorsal. No ventrals. Pectoral fins. A soft dorsal, caudal, and anal fin. Gymnodontes—XLII.

70. Præoperculum armed. Triglidæ, part—VII (Cottidæ.)

„ Præoperculum not armed. Sciænidæ—IX.

# CLASSIFIED CATALOGUE

OF

# TASMANIAN FISHES.

## Sub-class I. Teleostei.

### Fam. I. BERYCIDÆ.

1. **Beryx affinis**, G. (A.) *Nannegai* of Sydney Fishermen.
D. 7 : 12. A. 4 : 12 - 13. V. 1 : 7. L. lat. 41 - 43.
L. tr. 6 : 12.
Günth. Cat. I., p. 13. Allp. MS. Macleay's Cat., 317.
Rare.

2. **Trachichthys Macleayi**, Johnston. (T.)
D. 5 : 13. A. 3·10. V. 8. L. lat. 50. Ventral keel
13 scutes.
Proc. Roy. Soc. Tas., 1880.
Rare. Derwent. Colour, uniform bright golden yellow.

### Fam. II. PERCIDÆ.

3. **Perca fluviatilis**, Rondel. (I.) ***English River Perch.***
Common Reservoir, Stony Steps, Hobart; Lake Dulverton; Early Rises; Breadalbane.

4. **Callanthias Allporti**, Günth. (T.) ***Allport's Perch.***
D. 11 : 10. A. 3 : 10. L. lat. 46.
Ann. and Mag. Nat. Hist., 1876, vol. XVII., p. 390.
Allp. MS. Macl., 14.
Rare. Species described from two specimens sent to Dr. Günther by Mr. Morton Allport.

5. **Anthias Rasor**, Richards. (A.) ***Red Perch*** or ***Tasmanian Barber.***
D. 10 : 21. A. 3 : 9. L. lat. 54. L. tr. 4 : 18.
C. pylor. 6.
Günther's Cat., I., p. 93. Allp. MS. Macl. Cat., 16.
Common during the winter season, mouths of estuaries.

*Scorpis Hectori*, Hutton, appears to be very similar in most respects (even to ornament) to this species, which is *in high esteem* in the market during the season.

6. **Microperca Tasmaniæ**, nov. sp. *Native Freshwater Perch.*

D. 8 : 1·7 - 8. A. 3 8. V. 1·5. L. lat. 28 - 30.
L. tr. 12. P. 13.

Body compressed. Length of head equal to depth of body at shoulder, and contained in total length four times. Præoperculum not serrated. Scales relatively large ctenoid. Eye large, nearly as broad as length of snout; the latter contained in head four times; dorsal deeply cleft; the first spine slightly pointing forward when erect; situated immediately over the posterior extremity of pectoral; the second and third spines longest. Anal commencing in a vertical line, scarcely in advance of the first spinous ray of second dorsal. The second dorsal and the anal soft rays gradually increase in width, the last two or three being of equal length, and nearly half the height of the body. Caudal peduncle somewhat elongate. Caudal truncate. Colour dark olive, with a pinkish streak along the sides from shoulder to tail. Base of dorsal, anal, and caudal pinkish, with blackish margins. Belly silvery, tinged with gold. Eye dark blue, with golden streak around eye-ball. Abundant in the rivers of the South and North Esk. The young are found in large numbers in the shallow lagoons having connection with the rivers during some portion of the year. Length, 3 inches to 3½ inches.

7. **Lates colonorum**, Günth. (A.) *Brackish-water Perch.*

D. 8 : 1·10. A. 3·8. L. lat. 55. L. tr. 8 : 21.
Macl. Cat., 2. George's Bay (Swan).

I have seen one specimen from Anson's Lagoon. This species is said to be abundant in the fresh and land-locked brackish waters of the North-east Coast, particularly Anson's River. (Swan.)

8. **Apogon Guntheri**, Cast. (A.)

D. 7 : 1·9. L. lat. 26. L. tr. 11 - 12.
Cast. Proc. Zool. Soc. Vic., I., p. 46. Allp. MS.
(*Novæ Hollandiæ.*) Macl. Cat., 91.

Rare. Considered by Mr. Macleay that it may be identical with Val., *A. Novæ Hollandiæ.*

9. **Arripis truttaceus**, Cuv. and Val. (A.Z.) *The Native Salmon.**

D. 9 : 16 - 17. A. 3 : 10. L. lat. 48 - 52. L. tr. 6 : 12.
Cæc. pylor. 50.
(*A. salar*, Rich.) Günth. Cat., I., p. 253. Allp. MS.
Macl. Cat., 112.

Young entering estuaries in great numbers. Abundant all the year round. The young are spotted and barred. The markings disappear in mature individuals. (*A. salar.*)

10. **Histiopterus recurvirostris**, Rich. (A.) *Boar Fish.**

D. 9 : 15. A. 3·10 - 11. V. 1 : 5. P. 18. L. lat. 180.
Rich. Voy. *Erebus* and *Terror*, p. 34. Cast. Proc. Zool. Soc. Vic., I., p. 109. Allp. MS. Macl. Cat., 156.

*Captured occasionally* in the Derwent.

11. Erythrichthys nitidus, Rich. (A.Z.)
B. 7. D. 9 : 3 : 1·9 - 10. A. 5·10. L. lat. 96.
L. tr. 8 : 20.
Günth. Cat., I., p. 395. Allp. MS. Macl. Cat., 185.
Rare.

### Fam. III. MULLIDÆ.

12. Upeneus porosus, Cuv. and Val. (A.Z.) *Red Mullet.*
D. 8 : 1·8. A. 7. L. lat. 30.
Günth. Cat., I., p. 400. Allp. MS. Macl. Cat., 227.
Rare. I have not seen any specimens.

### Fam. IV. SPARIDÆ.

13. Girella tricuspidata, Cuv. and Val. (A.) *Black Bream.***
D. 15 : 11 - 13. A. 3·11 - 12. L. lat. 50 - 54.
L. tr. 10 - 11 : 20 - 23.
Günth. Cat., I., p. 428. Macl. Cat., p. 231.
Common Formby, Port Sorell, George's Bay, Southport. Does not ascend estuaries as far as *Chrysophrys Australis*, (Günth.)

14. Girella simplex, Rich. (A.) *The Sweep.***
D. 15 - 14 : 12 - 13. A. 3·11 - 12. L. lat 55.
L. tr. 11 - 12 : 20 - 23.
Günth. Cat., I., p. 429. Macl. Cat., 232.
Common Southport. Taken with *G. tricuspidata.*

15. Haplodactylus arctidens, Rich. (T.)
D. 16 : 1·18. A. 3·7. Cæc. pylor., 4. Vert. 16 : 18?
Günth. Cat., I., p. 335. Allp. MS. Macl. Cat., 240.
Port Arthur. Rare.

16. Chrysophrys Australis, Günth. *The Tasmanian Silver Bream.***
D. 11 : 10 - 11. A. 3·8. L. lat. 44 - 45. L. tr. 5 : 13.
Günth. Cat. I., p. 494. Allp. MS. Macl. Cat., 259.
Abundant during certain seasons at the mouths of rivers and streams. Scamander River, George's Bay, Brown's River, Jordan River.

17. Pagrus unicolor, Cuv. and Val. (A.Z.) *Schnapper.***
D. 12 : 10. A. 3·8. L. lat. 52. L. tr. 8 : 17.
Cæc. pylor. 5.
Günth. Cat., I., p. 468. Allp. MS. Macl. Cat., 255.
Abundant on Australian coasts. Not common. Its place seems to be occupied in Tasmanian waters by the Trumpeter (*Latris hecateia*, Rich.) (See Gen. Obs.)

### Fam. V. SQUAMIPINNES.

18. Scorpis Georgianus, Cuv. and Val. (A.)
D. 9 : 26. A. 3 : 27.
Günth. Cat., II., p. 64. Allp. MS. Macl. Cat., 209.
Rare. Not seen.

## Fam. VI. CIRRHITIDÆ.

19. CHIRONEMUS MARMORATUS, Günth. *Large Kelp-fish.**

D. 14 : 1·18. A. 3·6. L. lat. 55.

Günth. Cat., II., p. 76. Macl. Cat., 263.

Caught occasionally towards the mouth of the Derwent.

20. CHILODACTYLUS SPECTABILIS, Hutton.

D. 17 : 26. A. 3·9. L. lat. 55. L. tr. 5 : 16.

Hutton, Cat. New Zealand Fishes, p. 8. Allp. MS. Macl. Cat., 272.

Not seen. (See *C. Allporti*, Günth.)

21. CHILODACTYLUS ALLPORTI, Günth. *The Carp.*

D. 17 : 25 - 28. A. 3·9. P. 8·6. L. lat. 55 - 56.

Günth. Ann. Nat. Hist., 1872, vol. X., p. 184. Macl. Cat., *(C. spectabilis)*, 272.

Common around the coast. Abundant Wedge Bay, 5 to 6 fathoms. Caught in graballs. I have retained, for the present, this species, notwithstanding the fact that Dr. Günther has suppressed the name in favour of Hutton's *C. spectabilis*. The differences, which are constant, are, that in *C. Allporti* the fourth spine of dorsal is never as long as fifth and sixth; the fifth, sixth, and seventh being nearly equal, and longest. In *C. spectabilis* the upper one of the six simple rays appears to be longest: in *C. Allporti* the second uppermost is invariably the longest. In the latter, too, the anterior dorsal at least is light reddish, not blackish, as in the description of the New Zealand form.

22. CHILODACTYLUS MACROPTERUS, Rich. *Black and Silver Perch.***

D. 17 - 18 : 25 - 28. A. 3·12 - 14. P. 9·6.
L. lat. 55+4 - 5. L. tr. 6 : 13 - 15.

(*C. asperus*, Rich.) Günth. Cat., II., p. 78-9. Allport MS. Macl. Cat., 267, 268.

Abundant all the year round. Mature individuals in the neighbourhood of reefs 5 to 6 fathoms. Young ascend to the shallow banks of estuaries. The Black Perch is most esteemed as food. A most variable species. (See GEN. OBS.)

23. CHILODACTYLUS NIGRIPES, Rich.

D. 18 : 26. A. 3·10. L. lat. 61. 5 simple pectoral rays.

Günth. Cat., II., p. 82. Allp. MS. Macl. Cat., 270.

Approaches the variable *C. macropterus* very closely. I have not seen any specimens. Doubtful.

24. CHILODACTYLUS GIBBOSUS, Rich. *The Magpie Perch.***

D. 17 : 26 - 33. A. 3·9 - 10. L. lat. 63. 6 simple rays.

Günth. Cat., II., p. 84. Macl. Cat., 271.

Not uncommon. Caught off Wedge Bay, in 5 to 6 fathoms water, in graball. In the Tasmanian specimens there are invariably 6 simple pectoral rays, the second uppermost being longest, the third nearly reaching to it. The prominent feature however, not noted in the original description, is the two broad dark brownish transverse bands,—the first, from the fifth to the thirteenth dorsal spines, running obliquely backwards and terminating under the belly behind ventral; the second, from about the third to the eleventh soft dorsal spines, terminating towards the posterior rays of anal. It is doubtful whether the Tasmanian form can fairly be included within the *C. gibbosus*, Rich.

25. NEMADACTYLUS CONCINNUS, Rich.

D. 17 : 28. A. 3·15. L. lat. 50. Cæc. pylor. 4. Vert. 34.
Günth. Cat., II., p. 85. Allp. MS. Macl. Cat., 275.

Rare. Port Arthur. I have not seen any specimens. I have often seen the scales rubbed off the opercles of *Chilodactylus macropterus*: in this state the latter would agree with *Nemadactylus concinnus* in nearly every respect, with the exception of number of branchiostegals, which latter may be an abnormal feature in the original type. Requires confirmation.

26. LATRIS HECATEIA, Rich. (Z). *The Trumpeter.***

D. 17 : 1. 36-38. A. 3·28-30. P. 9·8-9. L. lat. 110.
Günth. Cat., II., p. 86. Allp. MS. Macl. Cat., p. 276.

Abundant all the year round. Esteemed as the finest of all our edible fishes. Caught—"school-fish," half-grown, in 10 to 20 fathoms water; the mature fish in 20 to 80 fathoms on coral reef banks or reefs, Macquarie Harbour to Seymour. (*See* GEN. OBS.)

27. LATRIS FORSTERI, Cast. (A). *The Red and Silver Bastard Trumpeter.***

D. 16 : 1·37-42. A. 3·33-36. P. 9-10·8-9. L. lat. 115-120.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 77. Macl. Cat., 278.

The young and half-grown fish, known as Red Bastard Trumpeter, are got in shallower banks of the estuaries in great abundance all the year round. The Silver or mature Bastard Trumpeter is only taken in graball nets, in 5 to 6 fathoms water, during January, February, and March. It would appear that the mature fish live at a great depth, 20 to 80 fathoms, all the remainder of the year, and only approach the shallower reefs, 5 to 6 fathoms deep, during spawning season. Next to the Real Trumpeter, the Silver Bastard is most prized for food. Abundant during the season, January to March. (*See* GEN. OBS.) (*L. inornata*, Cast.), (*L. bilineata*, Cast. ?)

28. LATRIS CILIARIS, Forst.

D. 17 : 39. A. 3·32. L. lat. 84. Six simple pectoral rays.
Günth. Cat. II., p. 86. Allp. MS. Macl. Cat., 277.

I have never seen this species in Tasmanian waters. I am of opinion that local naturalists have hitherto confounded the last species with *L. ciliaris*, Forst., and that it does not exist here.

29. **Mendosoma Allporti**, Johnston. *The Real Bastard Trumpeter*** of Fishermen.
B. 6. D. 23 : 1·25-26. A. 3·18-19. P. 15-16.
L. lat. 72-74; L. tr. 5 : 16-17.
Proc. Roy. Soc. Tas., 1880, pp. 54-55.
Not uncommon during the winter season. Found while Trumpeter-fishing off the south-east coast.

## Fam. VII. TRIGLIDÆ.

*(Includes the Scorpænidæ and Cottidæ, erected into independent families in recent works.)*

30. **Sebastes percoides**, Soland. (A.Z.) *Gurnet.**
D. 11 : 1·12. A. 3·5. L. lat. 60-65.
Günth. Cat., II., p. 101. Allp. MS. Macl. Cat., 282.
Abundant about George Town; common round the coasts on rocky bottom. *S. Allporti*, Cast., appears only to be a variety of *S. percoides.*

31. **Scorpæna cruenta**, Soland. (A.Z.) *Gurnet.*
D. 11 : 1·10. A. 3·5. L. lat. 45?
Günth. Cat., II., pp. 115, 520. Allp. MS. Macl. Cat., 284.
Common on shallow rocky bottom all round the coasts and estuaries. The species common about Hobart has only 25 rows of scales along lateral line. Either Solander's species is wrongly described in this particular, or the Tasmanian form is a distinct species.

32. **Scorpæna panda**, Rich. (A.Z.)
D. 12 : 1·8. A. 3·5. L. lat. 67.
Günth. Cat., II., p. 117. Allp. MS. Macl. Cat., 287.
Not common.

33. **Glyptauchen panduratus**, Rich. (A.)
D. 17 : 7. A. 3·6. V. 1·5.
Günth. Cat. II., p. 121. Allp. MS. Macl. Cat., 291.
Rare.

34. **Holoxenus cutaneus**, Günth. (T.)
D. 7 : 3·10. A. 9. C. 12. V. 1·5.
Ann. Mag. Nat. Hist., 1876, vol. XVII., p. 393.
Allp. MS. Macl. Cat., 299.
I have not seen the above, but I have good reason for supposing that the fish, not otherwise mentioned, known here as the *Velvet Fish*, is probably the same, although the spinous characters are not in agreement with those of *H. cutaneus.* They are as follows:—

B. 5. D. 8 : 5·10. A. 3·9. C. 12-13. V. 1·5. *Velvet Fish.*

The body is compressed, covered like the fins with loose skin, which in a great measure connects and conceals the minute spinous rays in the sinus between the anterior and posterior dorsal rays. The whole of the skin on body and fins is covered with minute glandular skinny appendages, so soft to the touch as to give the notion of velvet. The colour, when fresh, is a uniform deep purple, sometimes more or less marbled with yellow, which probably changes to white in spirits. The teeth are more granular than villiform. Average total length, 10 inches. In all other respects it agrees with *H. cutaneus*. Should it prove to be a distinct species I propose for it the name *Holoxenus Güntheri*.

35. **Pentaroge marmorata**, Cuv. et Val. (A). *The Soldier.*
B. 7. D. 12 - 13 : 10. A. 3·6.
Günth. Cat., II., p. 132. Allp. MS. Macl. Cat., 300.
Common in shallow banks of estuaries. The spines are evidently poisonous weapons, as they inflict painful wounds.

36. **Platycephalus bassensis**, Cuv. et Val. (A). *The Common Red Flathead.* *
D. 1 : 7 : 14. A. 14. L. lat. 115.
Günth. Cat., II., p. 179 *(Tasmanius)*. Allp. MS. Macl. Cat., 444.
Abundant all round the coasts and estuaries.

37. **Platycephalus cinereus**, Günth. (A). *The Black Flathead.* *
D. 1 : 7 : 12. A. 12. L. lat. 120.
Allp. MS. Macl. Cat., 450.
Brought to market rarely. Not uncommon.

38. **Lepidotrigla vanessa**, Rich. (A.) *Butterfly Gurnard.**
D. 11 : 17. A. 17. L. lat. 70. Cæc. pylor. 8.
Gunth. Cat., II., p. 197. Allp. MS. Macl. Cat., 461.
Captured occasionally in the estuaries of the Derwent and Tamar.

39. **Trigla polyommata**, Rich. (A.) *The Flying Gurnard.**
D. 7 - 9 : 12 - 13. A. 12. Cæc. pylor. 8.
Günth. Cat., II., p. 204. Allp. MS. Macl. Cat., 464.
Not uncommon, during May and June, in the estuaries of the Derwent and Tamar.

40. **Trigla Kumu**, Less. and Garn. (A.Z.) *The Kumu Gurnard.**
D. 9 - 10 : 16 - 17. A. 15. Cæc. pylor. 6.
Günth. Cat., II., p. 204. Macl. Cat., 463.
Rare. Derwent.

## Fam. VIII. TRACHINIDÆ.

41. **Kathetostoma læve**, Bl. (A.Z.) *Stone-lifter*; *Cat-fish.*
D. 17. A. 17. V. 1·5.
Günth. Cat. II., p. 231. Allp. MS. Macl. Cat., 406.
Not uncommon on northern coasts.

42. **Perois Allporti**, Günth. (T.)
D. 5 : 21. A. 16. L. lat. 62. L. tr. 8½ : 15.
Allp. MS. Macl. Cat., 409.
*Rare. Derwent.*

43. **Aphritis Urvillii**, Cuv. and Val. (T.) *Freshwater Flathead* or *Sandy*.*

D. 6 : 19. A. 25. L. lat. 65. Cæc. pylor. 4.

Günth. Cat., II., p. 242. Allp. MS. Macl. Cat., 410.

Common in the lower waters of fresh-water streams near to the sea, especially on the eastern coast. All the specimens examined by the writer had seven spines in anterior dorsal fin. The first spine is invariably closely adpressed to the second, and hence the possibility that a mistake has been made.

44. **Sillago ciliata.** Cuv. and Val. (A.) *The Whiting*.**

D. 11 : 1·17 - 18. A. 2·18 - 19. P. 14 - 15. L. lat. 70. L. tr. 4 - 5 : 11 - 12.

Günth., II., 245. Allp. MS. Macl. Cat. *(Bassensis)*, 414.

The characteristic form found occasionally in abundance during the months of November, December, and January has the above characters. When caught, however, there are six to seven faint irregularly oblique bars running across the sides in a forward direction from dorsal to lateral line. Faint oblique streaks of olive upon interspaces between dorsal rays. There are invariably 70 rows of scales along lateral line. Depth in total length varies from 4½ to 5½ times. Average length 10 inches. The Tasmanian Whiting may be an intermediate form linking *S. maculata* (Quoy and Gaim.) and *S. ciliata* (C. and V.) Highly esteemed as food.

45. **Sillago maculata**, Quoy and Gaim. (A.) *Spotted Whiting*.**

D. 11 : 1·20. A. 1·21. L. lat. 70. L. transv. 5·6 : 7.

Günth. Cat. II., 245. Macl. Cat., 412.

It is doubtful whether this form exists in Tasmanian waters. Some of the last-mentioned variable species, however, can with difficulty be separated from *S. maculata.*

46. **Bovichthys variegatus**, Rich. (A.)

D. 8 : 18. A. 13.

Günth., II., p. 250. Allp. MS. Macl. Cat., 419.

Rare.

## Fam. IX. SCIÆNIDÆ.

47. **Sciæna antartica**, Cast. (A.) *Victorian Kingfish.*

D. 9 : 1·27. A. 2·7. P. 17. L. lat. 68.

Allp. MS. Macl. Cat., 329. Cast. Proc. Zool. Soc., vol. I., p. 100.

Rare in Tasmanian waters.

48. **Sciæna aquila**, Lacep. (E.) European *Maigre.*

D. 10 : 1·26 - 27. A. 2·7. L. lat. 53. L. tr. 11·20.

Günth. Cat., II., p. 292. Allp. MS. Macl. Cat. *(Antartica)*, 329. Cast. *(Antartica)*. Proc. Zool. Soc., vol. I., p. 100.

*There is some reason for the belief that only one species exists in* Australian waters. As Dr. Günther recognises an important difference in *L. lat.* as of specific value, there is no doubt but that Cast. *S. antartica* is distinct from the *Maigre* of Europe. I have, however, retained both species, as it is conceivable that both forms may exist in Tasmanian waters.

## Fam. X. TRICHIURIDÆ.

49. LEPIDOPUS CAUDATUS, White. (Z.E.) *The Frost Fish* or *Scabbard Fish.*

D. 102 - 104. A. 24 - 25. Cæc. pylor. 23. Vert. 41 : 71.
Günth. Cat., II., p. 341. Allp. MS. Macl. Cat., 333.

Odd individuals caught in the Derwent occasionally in the winter. Wide-world in its range of distribution,—Europe, Africa, Australia, and New Zealand.

50. THYRSITES ATUN, Cuv. and Val. (A.Z.) *The Barracouta.***

D. 20 : 1·10 : VI. A. 1·10 : VI. Vert. 37.
Günth., Cat., II., p. 350. Allp. MS. Macl., 336.

Most abundant off the South-east Coast, preying chiefly upon the shoals of Anchovies and Sprats. Caught with a jigger abundantly all the year round.

51. THYRSITES MICROPUS, M'Coy.

D. 17 : 4·12 : VI. A. 2·11 : IV. V. 1·1. P. 14.
C. 22 : 4·4.
M'Coy. Ann. and Mag. Nat. Hist., 1873, vol. XI., p. 338.
Macl. Cat., 337.

Prof. M'Coy terms this the "Tasmanian Kingfish," but this seems to be a mistake. The following species, *T. solandri*, is the common fish known by that name here. *T. micropus*, (M'Coy) must be extremely rare, as I have not yet met with a fish which agrees with the above characters.

52. THYRSITES SOLANDRI, Cuv. and Val. *The Kingfish* of Tasmania.**

D. 17 - 18 : 1·17 - 18 : I - II. A. 1·13 - 18 : II.
Günth. Cat., II., p. 352. Allp. M.S. Macl. Cat., 338.

Migratory. Appear in immense numbers at certain seasons (December to June) in pursuit of the Horse Mackerel. Caught with a swivelled barbless hook, at night. Voracious in the extreme,—individuals frequently attacking each other, and also the allied species, the Barracouta.

The following five specimens, taken from a large number indiscriminately, give a fair notion of the variability of some of the characters of the species as found in Tasmanian waters :—

(1.) D. 18 : 1·17 : II. A. 1·16 : II. P. 14.
(2.) D. 18 : 1·17 : I. A. 1·15 : II. P. 14.
(3.) D. 18 : 1·17 : II. A. 1·13 : II. P. 14.
(4.) D. 18 : 1·17 : II. A. 1·14 : II. P. 14.
(5.) D. 18 : 1·7(3): II. A. 1·14 : II. P. 15.

No. 5 has been deformed. The soft dorsal portion had received an injury at one time, and three abortive detached finlets have grown in place of the usual ten destroyed.

Full size (No. 2) about 38 to 40 inches long, and about 18 inches greatest girth. One of the most important food fishes of Tasmania.

Fam. XI. SCOMBRIDÆ (including the *Nomeidæ* and *Cyttidæ* of some authors).

53. **Gasterochisma melampus**, Rich. (Z). *Butterfly Fish.*

B. 7. D. 17 : 1·10 : VI. V. 1·5. H. 2·10 : VI. P. 21. L. lat. 64. L. tr. 27.

Günth. Cat., II., p. 387. Hutton, Cat., N.Z., p. 20.

The fish from which the above characters were taken was recently captured at the mouth of the estuary of the Derwent. Hitherto it has only been seen on rare occasions off the coast of New Zealand. The following are the principal dimensions :—Total length, 39 inches ; length of body, 35 inches ; length of head, 8¾ inches ; length of snout, 4 inches ; length of pectoral fin, 5¼ inches ; length of anal fin, 5¾ inches (not reaching to vent as in Dr. Günther's figure ; greatest depth, 9 inches ; least depth, 1 inch ; breadth of eye, ¾ inch ; distance of extremity of maxillary from snout, 4 inches ; distance of 1st ray of posterior dorsal from snout, 20¼ inches ; distance of extremity of 1st ray of anal from snout, 23 inches. In the figure in Dr. Günther's "Study of Fishes," p. 455, the anterior dorsal spines exceed in length the 1st soft rays of dorsal and anal. In the mature specimen above described, the highest of the gently arched anterior dorsal spines are not so long as either the first longest soft ray of anal or dorsal, which are nearly equal.

54. **Scomber australasicus**, Cuv. and Val. *The English Mackerel*, or *Southern Mackerel.* **

D. 10 : 1·11 : V. A. 1 : 1·11 : V. L. lat., about 160.

Günth. Cat., II., p. 359. Allp. MS. Macl. Cat., 392.

I have not seen specimens, but the fishermen assure me that a fish called by them *The English Mackerel* is seen in immense shoals, after long irregular intervals of time, on the East Coast, followed, as in the case of the Horse Mackerel, by their rapacious enemies the Kingfish. Professor M'Coy (Zool. Vict., Dec., III., p. 43,) gives reasons for regarding the Hobson's Bay species,—which most probably may prove to be identical with the Tasmanian,—to be merely a variety of *Scomber pneumatophorus* (De la Roche), viz.—

D. 12 : 1·11 : V. A. 1·12 : V. P. 19. C. 17.

55. **Thynnus thynnus**, L. (E). *The Tunny.*

D. 14 : 1·13 : IX. A. 2·12 : VIII. Vert. 16·23.

Günth. Cat., II., p. 362. Allp. MS.

Seen occasionally in the estuary of the Derwent. Have not examined any specimens.

56. **Naucrates ductor**, L. (E). *The Pilot Fish.*

D. 3 - 6 : 1·26 - 28. A. 2·16 - 17. Cæc. pylor. 12 - 15. Vert. 10 - 16.

Günth. Cat., II., p. 374. Allp. MS. Macl. Cat., 559.

*Not uncommon* in Tasmanian waters.

57. **Echeneis remora**, L. (E). *The Sucking Fish.*
D. 16 - 18 : 22 - 24. A. 25. Cæc. pylor. 6. Vert. 12 : 10.
Seen occasionally.

58. **Zeus faber**, L. (E). *John Dorey.*
D. 10 : 23. A. 4·22. V. 1·6.
Günth. Cat., II., 393. Allp. MS. Macl. *(australis)* Cat., 386.
I have not seen any specimens from Tasmanian waters. Fishermen usually designate the following species by the name "John Dorey," and hence the evidences given are very unsatisfactory.

59. **Cyttus australis**, Rich. (A.Z.) *The Bastard Dorey.***
B. 8. D. 8 : 1·28 - 29. A. 2·30. P. 11. V. 1·6.
Günth. Cat., II., p. 396. Allp. MS. Macl. Cat., 387.
Abundant during the month of April in the estuaries of the Derwent and Tamar, but although a fine edible fish it is rarely captured, probably owing to the lack of the proper kind of net. Graball and seine-nets only are used by Tasmanian fishermen.

## Fam. XII. CARANGIDÆ.

60. **Trachurus trachurus**, Cuv. and Val. (A.Z.) *Horse Mackerel.* **
D. 8 : 1·32 - 35. A. 2 : 1·25 - 29. L. lat. 75 - 86.
Günth. Cat., II., p. 419. Allp. MS. Macl. Cat., 347.
Appear in immense shoals at times between January and June, and might with proper appliances become the source of a valuable industry. Their appearance in very large schools is an indication of the presence of the much prized Kingfish.

61. **Caranx Georgianus**, Cuv. and Val. (A.) *The White* or *Silver Trevally.***
D. 8 : 1·26 - 29. A. 2 : 1·22 - 24. L. lat. 20 - 25.
Günth. Cat., II., p. 440. Allp. MS. Macl. Cat., 350.
A valuable food fish. Immense numbers of the young have at times been captured in the estuaries during the autumn. The larger fish, 10 to 12 lbs. weight, are taken in deeper water.

62. **Seriola Lalandii**, Cuv. and Val. (A.) *Port Jackson Kingfish.*
D. 7 : 1·32 - 34. A. 2 : 1·20 - 21.
Günth. Cat. II., p. 463. Allp. MS. Macl. Cat., 365.
Doubtful. I have not seen any specimens. May have been mistaken for the following species.

63. **Seriola grandis**, Cast. (A.) *Tasmanian Yellow-tail.* **
D. 6 : 1·32 - 35. A. 0 : 1·20. P. 21. V. 5.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 115. Macl. Cat., 368.
Appear in schools; abundant off the George Town Heads regularly during a brief season (autumn) every year. *Take bait greedily.*

64. **Neptonemus brama**, Günth. (T.) *Snotgall Trevally.* **
D. 7 : 2·27 - 29. A. 2 : 1·22 - 23. L. lat. 88. L. tr. 16 : 25.
Günth. Cat. II., p. 390. Macl. Cat., 370.

The young are caught about the wharves at Hobart in abundance during the months of February, March, and April. They sometimes, in the mature state, reach a size of 2 ft. 6 in., and weigh from 12 to 14 lbs. (Barnett). The large fish do not ascend the upper shallow waters of estuaries.

65. **Neptonemus dobula**, Günth. (T.) *Mackerel Trevally.***
D. 7 : 1·37 - 40. A. 2 : 1·23. Vert. 24.
Günth., Pro. Zool. Soc. Lond., 1869, p. 429. Allp. MS.
Macl. Cat., 371.

This is a smaller and more elongate fish than the former; is considered a greater delicacy for the table; and rarely attains a length of 12 inches. Its habits are similar to the former species, but approaches the upper waters of estuaries seldomer and more irregularly.

66. **Neptonemus travale**, Cast. *Port Jackson Snotgall.*
D. 6 : 2 - 30. A. 2 : 2·21. L. lat. 93.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 119. Allp. MS.
Macl. Cat., 372. Tasmania (Allport).

Doubtful. I have not seen any specimens from Tasmanian waters.

67. **Temnodon saltator**, Bl. *Tailor* or *Skipjack.*
D. 8 : 1·24 - 26. A 1 - 2 : 1·26 - 28. L. lat. 90 - 100.
L. tr. 8 : 19. Vert. 12 : 14.
Günth. Cat., II., p. 479. Allp. MS. Macl. Cat., 375.

An odd individual caught occasionally in the Derwent.

## Fam. XIII. GOBIIDÆ.

68. **Gobius Tamarensis**, nov. sp.
B 4. D. 6 : 1·8. A. 1·8. L. lat. 32. P. 16 - 18.
C. 18 - 19.

Height of body seven times in total length, the length of head four times, and the greatest breadth behind orbits, six times. Head depressed; eyes approximating towards top of head, looking upward and outward. Snout obtuse convex, one and a half times breadth of eye, and contained three and a half times in length of head; interorbital space narrow, half the breadth of eye; head and nape naked. Colour when alive, greyish. Body and vertical fins marbled with very fine reddish-brown dots. The extremities of the rays of second dorsal and anal fins blackish; there are eleven scales between anal fin and 1st ray of 2nd dorsal; caudal fin rounded; dorsal and anal fin-rays one and a half times as long as snout—when stretched they do not reach caudal by a distance greater than their own length.

Enters the fresh water of the Tamar in great abundance. Two inches to two and three-fourth inches long.

*This species approaches very close to Gobius lateralis, (Macleay.)*

## Fam. XIV. PEDICULATI.

69. Brachionichthys hirsutus, Lacep. *The Hand-fish.*

D. 1. 2 : 10 - 19. A. 9. P. 7. V. 1·4.

Günth. Cat., III., p. 182. Allp. MS. Macl. Cat., 430 - 431.

I am of opinion that *B. hirsutus* and *B. lævis* cannot be separated. *B. hirsutus* is very variable in colour, in the development of the minute spines on surface of skin, and in the number of soft rays of dorsal. The membrane connecting anterior spines is not connected with the first of the series, which is rather a species ot tentacle than a spine. The tentacle is lax, hangs forward, and its lobe is really plumose in living specimens. Not uncommon in the estuary of the Derwent. Mrs. Meredith has very faithfully painted this species in her "Tasmanian Friends and Foes," under the name *B. politus.*

70. Brachionichthys politus, Rich. *The Red Hand-fish.*

D. 1 : 2 : 17. A. 9. P. 9. V. 1 : 4.

Rich., Voy. of *Ereb.* and *Ter.*, p. 16. Allp. MS. Macl. Cat., 432.

Rare. For reasons stated under the preceding species, it is not improbable that there may be individuals which may link the two species together.

## Fam. XV. BLENNIDÆ.

71. Blennius Tasmanianus, Rich. *Blenny* or *Bully.*

B. 6. D. 12 : 17 - 18. A. 2·19. P. 14.

Günth. Cat., III., p. 214. Allp. MS. Macl. Cat., 545.

Common.

72. Salarias meleagris, Cuv. and Val. *Blenny.*

D. 12 : 20. A. 22.

Günth. Cat., III., p. 256. Allp. MS. Macl. Cat., 562.

Common.

73. Clinus despicillatus, Rich. *Blenny.*

D. 3·35·4. A. 2·25. V. 1·3.

Günth. Cat., III., p. 271. Allp. MS. Macl. Cat., 572.

Common.

74. Cristiceps australis, Cuv. and Val. *Blenny.*

D. 3·27 - 29·5 - 8. A. 2·23 - 25. V. 1·3. Vert. 15 : 31.

Günth. Cat., III., p. 275. Allp. MS. Macl. Cat., 580.

Common.

75. Cristiceps Forsteri, Cast. *Blenny.*

D. 3·29·4. A. 26. V. 1·3.

Cast. Proc. Zool. Soc. Vic., vol. I., p. 132. Allp. MS. Macl. Cat., 588.

Common.

## Fam. XVI. SPHYRÆNIDÆ.

76. LANIOPERCA MORDAX, Günth. *Tasmanian Jack* or *Pike.**
D. 5 : 1·19. A. 2·25 - 29. P. 16. L. lat. 66.
Günth. Ann. and Mag. Nat. Hist., 1872, vol. X., p. 183. Allp. MS. Macl. Cat., 608.
Not uncommon in the Derwent.

## Fam. XVII. ATHERINIDÆ.

77. ATHERINA PRESBYTEROIDES, Rich. *Silver Belly.*
D. 9 : 10 - 11. A. 1·12. P. 11. Vert. 46.
Günth. Cat., III., p. 397. Allp. MS. Macl. Cat., 397.

78. ATHERINA HEPSETOIDES, Rich. *Silver Belly.*
D. 9 : 1·11. A. 1·14. P. 15. Vert. 48.
Günth. Cat., III., p. 397. Allp. MS. *(hepsetus?)* Macl. Cat., 609.
Port Arthur (Richardson).

79. ATHERINA HEPSETUS, L.
Günth. Ann. and Mag. Nat. Hist., 1876, p. 396. Allp. MS.

80. ATHERINA MICROSTOMA, Günth. *Silver Belly.*
D. 6 : 1·10. A. 1·12. P. 12. L. lat. 40. L. tr. 8.
Günth. Cat., III., p. 401. Allp. MS. Macl. Cat., 614.
Tasmania (Günther).

81. ATHERINA TAMARENSIS, nov. sp. *Silver Belly.*
B. 7. D. 8 : 1·11. A. 1·10 - 11. V. 1·5. P. 13. L. lat. 42. L. tr. 9.
Body somewhat compressed; cleft of mouth oblique. The origin of the first dorsal commences almost on a vertical line behind ventral. Eye relatively large, one-third the length of head, and slightly exceeding the length of snout. Scales cycloid, of moderate size. Three series of scales above silvery band which runs along the sides. Teeth minute.
Abundant Launceston Bar, River Tamar.

82. ATHERENICHTHYS JACKSONIANA, Quoy and Gaim.
D. 8·1 - 11. A. 1·18.
Günth. Cat., III., p. 402. Allp. MS. Macl. Cat., 618.
Tasmania (Allport; Günther).

## Fam. XVIII. MUGILIDÆ.

83. MUGIL CEPHALOTUS, Cuv. and Val. *Sand Mullet.***
D. 4 : 1·8. A. 3·(7)8. L. lat. 38 - 40. L. tr. 14 - 15.
Günth. Cat., III., p. 419. Allp. MS. Macl. Cat., 631.
Common along the North-East Coast, George's Bay, *Scamander* River.

84. Agonostoma Forsteri, Bl. *Sea Mullet.***
D. 4 : 1·10. A. 3·12. L. lat. 55. Cæc. pylor. 3.
Günth. Cat. III., p. 465. Allp. MS. Macl. (Diemensis) Cat., 641.

Abundant in all the estuaries. Ascends the Tamar as far as Launceston, and the Derwent above Bridgewater.

### Fam. XIX. CENTRISCIDÆ.

85. Centriscus scolopax, L. (E.) *The Bugler* or *Trumpet Fish.*
B. 4. D. 5 : 12. A. 20. P. 16. V. 5. C. 6 + 4 + 5 + 7.
Günth. Cat., III., p. 518. Allp. MS. Tasmania (Allport).

It is questionable whether the Tasmanian species may not be *C. humerosus*, Rich. I have not yet examined any local specimens.

### Fam. XX. GOBIESOCIDÆ.

86. Crepidogaster Tasmaniensis, Günth.
B. 5. D. 10. A. 9.
Günth. Cat. III., p. 597. Allp. MS. Macl. Cat., 648.

Tasmania (Günther).

### Fam. XXI. TRACHYPTERIDÆ.

87. Regalecus gladius, Cuv. and Val. (E.) *The Ribbon Fish.*
B. 6. D. 342. A. 0. C. 0. P. 14. V. 1.
Günth. Cat., III., p. 308. Allp. MS. Macl. Cat., 651.

Specimen examined, 14 feet long, captured at the Penguin, Tasmania.

88. Trachypterus altivelis, Kner.
B. 6. D. 7 : 190. A. 0. C. 6 : 4-6. P. 11. V. 7.
Günth. Cat., III., p. 303.

Specimen in Royal Society's Museum, Hobart. Caught at Spring Bay, on the East Coast of Tasmania.

### Fam. XXII. HOPLEGNATHIDÆ.

89. Hoplegnathus Conwayii, Rich.
D. 12 : 12. A. 3·12.
Günth. Cat., III., p. 357. Allp. MS.

Tasmania (Allport.)

### Fam. XXIII. LABRIDÆ.

90. Cossyphus Gouldii, Rich. *Blue Groper.***
D. 11 : 11. A. 3·11. L. lat. 39. L. tr. 6 : 14.
Günth. Cat., IV., p. 111. Allp. MS. Macl. Cat., 693.

Common.

91. Labrichthys bothryocosmus, Rich. *Parrot Fish.**
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3 : 9.
Günth. Cat., IV., p. 114. Allp. MS. Macl. Cat., 695.

Common. (See Gen. Obs.)

92. Labrichthys fucicola, Rich. (A.) *Parrot Fish.*
B. 6. D. 9 : 11. A. 3·10. C. 14. P. 13. V. 1·5.
L. lat. 27.
Macl. Cat., 715.
Tasmania (Macleay.) Colour dark plum purple, towards belly buff, with four pale spots on the back. (See Gen. Obs.)

93. Labrichthys psittacula, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3·9. Vert. 9 : 16.
Günth. Cat., IV., p. 114. Allp. MS. Macl. Cat., 696.
Common. (See Gen. Obs.)

94. Labrichthys laticlavius, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 26. L. tr. 3·9. Vert. 9·16.
Günth. Cat., IV., p. 115. Allp. MS. Macl. Cat., 698.
Common. (See Gen. Obs.)

95. Labrichthys tetrica, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3·9.
Günth. Cat., IV., p. 116. Allp. MS. Macl. Cat., 700.
Common. (See Gen. Obs.)

96. Labrichthys Cuvieri, Cast.
D. 9 : 11. A. 3·10. L. lat. 27.
Cast. Proc. Zool. Soc. Vic., vol. II., p. 53. Macl. Cat., 708.
Hobart (Cast.)
It may be well to state here that I consider the classification of the genus *Labrichthys* to be far from satisfactory. I have good reason to believe that dependence upon colour markings, however peculiar and brilliant, is to a great extent delusive. Like the genus *Monocanthus*, many of them change colour with age. There are none of the genus in much favour as food,—with the exception of the Blue-head.

97. Odax balteatus, Cuv. and Val. (A.) The *Ground Mullet* of Fishermen.
D. 15-17 : 12 - 13. A. 3·12 - 13. L. lat. 39. L. tr. 4 : 13.
Vert. 19 : 17.
Günth. Cat., IV., p. 240. Allp. MS. Macl. Cat., 751.
Common. Entering fresh water occasionally. Derwent; George's Bay.

98. Odax Richardsoni, Günth. (A.) *The Stranger.**
D. 17 : 13. A. 3·11 - 12. L. lat. 60. L. tr. 7 : 20.
Günth. Cat. IV., p. 241. Allp. MS. Macl. Cat., 753.
Caught occasionally in the Derwent.

## Fam. XXIV. GADOPSIDÆ.

99. Gadopsis marmoratus, Rich. (A.) *Freshwater Blackfish.**
B. 6. D. 10 - 13 : 25 - 26. A. 3 : 18 - 19. V. 1.
*Günth. Cat., IV., p. 318.* Allp. MS. Macl. Cat., 763.

Abundant Ringarooma, Forrester, the Piper, and other rivers of the north-east of Tasmania, where they grow to a considerable size, and are highly esteemed for food. The species has been introduced from the north-east into the North and South Esk Rivers, and probably other streams, where they are now abundant, and afford ample sport to the meditative angler who cares to linger over a calm still water-hole during the hours of the night season. The angler must be careful, however, to provide himself with a good bull's-eye lantern, or his labours will be fruitless.

Prof. M'Coy has minutely described two species,—viz., *G. gracilis*, Yarra River, and *G. gibbosus*, Bunyip River, Gippsland,—based upon a slight variation of relation of length of head to body, together with an equally slight variation in the number of dorsal spines and other characters, which are extremely inconstant in this variable form. Having closely studied the variability of the Tasmanian *G. marmoratus* I am unable to admit that the characters which distinguish *G. gracilis* and *G. gibbosus* are sufficient to separate them from Richardson's *G. marmoratus*, for the individual variations of the latter species in the North Esk and other rivers of Tasmania are greater than the differences which Prof. M'Coy considers sufficient to form distinct specific characters. In support of this I give the general characters of seven individuals now before me, taken together from a spot near Corra Lynn, on the North Esk. They fairly represent the individual variability :—

| B. | D. | A. | P. | L. lat. | L. tr. | Total Length. | Head. | Head in Total Length. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | inches. | inches. | times. |
| (1) 7 | 13 : 26 | 3·19 | 17 | 130 to 140. | 18-20 : 48-55. | 7⅝ | 1¾ | 4·3 |
| (2) 7 | 12 : 26 | 3·18 | 17 | | | 6⅛ | 1½ | 4·0 |
| (3) 7 | 12 : 26 | 3·18 | 17 | | | 5¼ | 1 3/16 | 4·4 |
| (4) 7 | 12 : 28 | 3·18 | 17 | | | 10¾ | 2½ | 4·7 |
| (5) 7 | 12 : 26 | 3·18 | 17 | | | 8 | 1⅝ | 4·9 |
| (6) 7 | 13 : 26 | 3·18 | 17 | | | 8¼ | 1⅞ | 4·3 |
| (7) 7 | 11 : 27 | 3·17 | 17 | | | 5⅜ | 1 3/16 | 4·5 |

Thus the dorsal spines vary between 11 and 13, and the relation in length of head to total length from 4 to 4·9 times in the latter. These limits cover *G. marmoratus*, Rich.; *G. gracilis*, M'Coy; and *G. gibbosus*, M'Coy; and the other points described are equally variable within limits. I think it is clear, therefore, that the two last-named species cannot well be recognised. It is very hazardous in this genus to create a new species based upon the examination of only two or three individuals. It must be remembered also, that specimens in spirits would have the soft membrane bordering the flat opercular spine greatly contracted. This would affect the relative length of head and body.

## Fam. XXV. GADIDÆ.

100. **Lotella Swanii**, nov. sp.

B. 7. D. 4 : 60. A. 55. V. 8. P. 22 - 23. L. lat. 200.
L. tr. 22 : 62.

Head contained 4⅜ times in total length, and greatest depth 4½ times. Length of snout equal to diameter of eye, and about one-fifth the length of head. Distance between orbits half again as broad as diameter of eye. There is a series of 8 to 11 irregular teeth in upper and lower jaws. Scales small. Colour uniformly dark brown. Not common.

The above form appears to be intermediate between *L. phycis*, Schleg., and *L. callarius*, Günth. The differences are so marked, however, that I have thought it best to raise it into specific rank for the present. I am aware that there is a great variability in the allied genus *Pseudophycis*, and particularly in the common species known here as the Rock Cod (*P. barbatus*), Günth.; and when a larger number of individuals is examined it will be seen whether the limits of variability justify the separation or not. This is the species, probably, recorded in Mr. Allport's list as *L. phycis*.

Total length, 11 inches; length of body, 10 inches; length of head, 2½ inches; length of snout, ½ inch; length of barbel, ¾ inch; breadth interorbital space, ¾ inch; longest ventral ray, 1½ inches; longest anterior dorsal ray, 1 inch (3rd and 4th); longest posterior dorsal ray, ¾ inch; longest anal ray, ¾ inch; greatest depth of body, 2⅜ inches; least at caudal peduncle, ⅜ inch; snout to termination of first dorsal, 9¼ inches; snout to termination of anal, 9⅜ inches; snout to first ray of anterior dorsal, 2¾ inches.

101. **Pseudophycis barbatus**, Günth. *The Common-Rock Cod.***

D. 9 - 11 : 48 - 57. A. 44 - 57. V. 5. L. lat. 100 - 140.
P. 22 - 26. C. 28 - 29.
Ann. Mag. Nat. Hist., 1863, p. 116. Macl. Cat., 769.
M'Coy, Zool. of Vict., Dec., II., p. 29.

Common all the year round on all our coasts, and entering the shallow banks of estuaries in immense numbers during the winter months, when they are caught in very large numbers by amateur fishermen with hook and line. The young also appear in these shallows in very large numbers during the months of April and May. The Rock Cod, although somewhat soft, is held in great esteem as an article of food. The local variety agrees with the limits described by Prof. M'Coy, is equally variable, but it appears to present a local difference in the average size of scale. The Derwent Rock Cod rarely has more than 100 rows of scales along the lateral line. In all other respects it agrees with Prof. M'Coy's description already referred to. Mr. Allport has *P. bacchus* in his MS. list; but, as *P. barbatus* is not referred to, I am convinced that the latter was mistaken for the former. I have never seen a representative of *P. bacchus* in Tasmanian waters.

### Fam. XXVI. OPHIDIIDÆ.

102. **Genypterus Australis**, Cast. *The Ling.***
B. 7. D. 159. A. 123 - 126. P. 19. L. lat. 261 - 307.
Cast. Proc. Zool. Soc. Vic., vol. I., p. 164. Mac. Cat., 731. M'Coy, Zool. of Vic., Dec., III., p. 37.
Common occasionally in market. Highly esteemed as food. Prof. M'Coy is of opinion that the *G. Australis* may not be distinct from *G. blacodes*, Forst.

103. **Fierasfer Homei**, Rich.
B. 7. Vertical fins continuous, very low.
Günth Cat., IV., p. 382. Macl. Cat., 774. Allp. MS.
Rare. I have not seen any specimens. Tasmania (Rich.)

### Fam. XXVII. MACRURIDÆ.

104. **Macrurus Australis**, Rich. (A.)
D. 13·88. A. 87. V. 7. L. lat. 130. L. tr. 4 : 15. V. 14 : 53.
Günth. Cat., IV., p. 391. Allp. MS. Macl. Cat., 776.
Captured occasionally in the Derwent.

### Fam. XXVIII. PLEURONECTIDÆ.

105. **Amnotretis rostratus**, Günth. (T.) *The Sole* of Fishermen.**
B. 7. D. 79 - 81. V. dext. 6 - 7, sin. 4. L. lat. 89 - 90.
Günth. Cat., IV., p. 458. Allp. MS. Macl. Cat., 784.
Common in the upper shallows of estuaries. Valuable market fish. Taken in graball. Does not take bait.

106. **Rhombsolea monopus**, Günth. (A.) *The Common Flounder.***
B. 5. D. 59 - 60. V. 6. A. 42 - 43.
Günth. Cat., IV., p. 459. Allp. MS. Macl. Cat., 785.
Abundant in the upper shallows of estuaries. Taken in nets. Does not take bait.

107. **Rhombsolea tapirina**, Günth. (A.) *Flounder.***
B. 6 - 7. D. 64 - 66. A. 46 - 50.
Günth. Cat., IV., p. 459. Allp. MS. Macl. Cat., 786.
Common, but not so often seen in market as the two preceding species.

108. **Solea liturata**, Rich. (T.)
Rich. Trans. Zool. Soc., III., p. 156. Tasmania (Rich.)
I have not seen the description, and I doubt the existence of this genus in Tasmanian waters.

### Fam. XXIX. HAPLOCHITONIDÆ.

109. **Prototroctes maræna**, Günth. (A.) *The Freshwater Herring* or *Cucumber Fish.***
B. 6. D. 10. A. 19. P. 13. L. lat. 78. L. tr. 19.
*Günth. Cat., V.*, p. 382. Allp. MS. Macl. Cat., 824.

Abundant in all our principal rivers. Affords the finest sport of all our fishes to anglers. It is very much esteemed as a delicious table fish. Unfortunately, the introduction of the English Brown Trout (*Salmo fario* var. *Ausonii)* into many of our rivers threatens the extinction of this most valuable native fish. Sometimes reaches 12 to 13 inches long.

110. **Haplochiton Sealii**, nov. sp. *The Derwent Smelt.*

B. 6. D. 8 - 9. A. 19 - 20. V. 7. P. 9 - 12. Vert. 56-57.

Body naked. Total length, 5·3 times length of head, and nearly 10 times the height of the body. Head somewhat broad, depressed; interorbital space wide. Teeth in a single series, small, hooked, on maxillary and mandible,—minute on palate. Eye relatively large, diameter equal to length of snout, which latter is contained in head 3·2 times. Maxillary extending to a vertical line drawn through centre of eye; posterior end slightly enlarged, and curved downwards. Lower jaw slightly longer. Dorsal situated rather in advance of vent and behind ventral fin. Belly rounded. Adipose fin, membranous, rudimentary, broadly deltoid. Body ornamented with extremely minute dots; from the ventrals forward these minute blackish dots invariably form two parallel interrupted lines which ultimately gradually approach and unite at an acute angle under the mandibles. Silvery band along sides. This interesting species has the same migratory habit as *Retropinna Richardsoni*, Günth. It appears in the upper waters of the Derwent, near New Norfolk, in large shoals during the months of October and November. The females are then full of mature ova, which are comparatively large when compared with the size of the fish. The introduced English Salmonoids appear to prey upon these little fish to a great extent. When chased, the little fish may be seen leaping in scores from the surface of the water.

Average length, mature, 1½ to 2 inches.

### Fam. XXX. SCOPELIDÆ.

111. **Alepidosaurus ferox**, Lowe.

B. 6 - 7. D. 41 - 44. A. 14 - 17. P. 14 - 15. V. 9 - 10.

Günth. Cat., V., p. 421. Allp. MS. Macl. Cat., 837.
Tasmania (Rich).

I have not seen any specimens.

### Fam. XXXI. SALMONIDÆ.

112. **Retropinna Richardsoni**, Gill. (A.Z.) *Whitebait* or *Smelt.***

B. 6. D. 11 - 12. A. 17 - 20. P. 11. V. 6. L. lat. 61.

Günth. Cat., VI., p. 171. Macl. Cat., 840.

Captured in great abundance in the River Tamar, in the prawn nets, during the months of February and March, together with a species of *Atherina*, and *Galaxius attenuatus*, and are generally termed by fishermen, *Whitebait*. Dr. Günther had formerly supposed that this species was confined to New Zealand; it appears, however, to be common to Australia and Tasmania. These little fishes are much esteemed as food for the breakfast table.

113. SALMO SALAR, L. (I.) *The English Salmon.***

B. 11-12. D. 14. A. 11. P. 14. V. 9. L. lat. 120. L. tr. 22-26 : 19-22. Vert. 59-60. Cæc. pyl. 53-77.

Günth. Cat., VI., p. 13. Allport, Report Roy. Soc. Tas., Proc. 1866.

Shipment of ova arrived successfully by the *Norfolk*, which was safely delivered at the Salmon Ponds, Tasmania, on 21st April, 1864. Of this shipment at least about 500 fishes were successfully hatched and liberated in the Plenty. Some were retained in the Ponds for breeding purposes. The doubt whether the true *S. salar* has established itself in our waters is not yet set at rest, for no fish over 10 lbs. of a migratory form has yet been caught in the Derwent after the lapse of 18 years. The migratory type now successfully established seems to partake of a character intermediate between *S. trutta*, *S. Cambricus*, and *S. salar*. Many specimens examined by me, caught in the Derwent, agree with the grilse form of *S. salar* in nearly every characteristic, saving the relative length of maxillary bone as compared with snout. The snout is invariably somewhat obtuse, as in *S. trutta*, although in all other respects many individuals agree more closely with its noble congener, *S. salar*, than with the other two mentioned species. (See GEN. OBS.)

114. SALMO TRUTTA, Flem. (I.) English *Sea Trout* or *Salmon Trout.***

B. 11. D. 13. A. 11. P. 15. V. 9. L. lat. 120. L. tr. 24-26 : 36-34. Vert. 59-60. Cæc. pylor. 49-61, rarely less.

Günth. Cat., VI., p. 24; Allport's Report, Proc. Roy. Soc. Tas., 1866.

Ova introduced successfully by the *Lincolnshire* in the year 1866. As already pointed out with reference to *S. salar*, it is difficult to say whether the form resembling the above species, now abundant in the Derwent, is, properly speaking, *S. trutta* or not. It is in many respects more allied to *S. Cambricus*.

The following are the average limits of the common form:—B. 10-12. D. 13-14. A. 11-12. P. 14. V. 9. L. lat. 120. Cæc. pylor. 42-67. Maxillary, relative to snout, longer and thin; transverse series of scales from adipose fin forward to lateral line, 12-14; depth of operculum relative to length, 1¼ to 1⅙; hind part of body moderately elongate; vomerine teeth disappearing in specimens from 3 to 5 lbs. weight; caudal fin invariably emarginate in full grown specimens; colour usually bluish-black on back and shoulders, silvery on sides; parr markings, 11 to 12 bars, frequently seen in smolt stage.

Whether this local form is the result of hybridism, as *suggested by Dr.* Günther, or is simply the effects of the *differing* conditions of a new environment, I am as yet unable to decide,—perhaps a good deal may be due to both influences. It is noteworthy, however, that already in New Zealand and Tasmania the allied species *S. fario*, var. *Ausonii*, has developed into types which are peculiarly characteristic of particular local streams. This variability in relation to environment is very suggestive, and may yet help to explain the trifling variable differences in character, often overlapping, between *S. Cambricus*, *S. gallivensis*, *S. brachypoma*, and *S. trutta* of Scotch, English, and Irish streams.

I have already pointed out (*Mercury*, Hobart, Nov. 25, 1879,) that characters which may be greatly affected by environment are not to be depended upon, and, in the opinion of some authorities in other branches of natural history, such differences would not be recognised as of specific or even sub-specific rank. The assumption of hybridism is to me extremely unsatisfactory, for the reason that the extreme types steadily perpetuate themselves in European waters notwithstanding the extraordinary facilities among fishes for intercrossing by natural means which probably have existed unrestricted for ages.

115. SALMO FARIO, *var.* Ausonii, L. (I.) *English Brown Trout.***

D. 13 - 14. A. 10 - 11. P. 13. V. 9. L. lat. 120. L. tr. 26 : 30. Cæc. pylor. 38 - 51. Vert. 57 - 58.

Günth. Cat., VI., p. 64. Allp. Rep. Pro. Roy. Soc. Tas., 1866.

Ova introduced successfully, together with the former species, per the *Lincolnshire*, in the year 1866.

The species now abound in all the principal rivers of Tasmania, and sometimes reach the enormous weight of 28 lbs., and a length of three feet. The new conditions in our rivers appear to have greatly modified their general form and character. The following limits of variability show that the old limits of characters are not of much value here :—B. 9 - 12. D. 13 - 14. A. 10 - 11. P. 13 - 16. V. 9. L. lat. 120. Pylor. cæc. 41 - 72. Maxillary strong and, relative to snout, generally much longer; hind part of body generally short and high; vomerine teeth in specimens 3 to 5 lbs. weight generally disappearing; caudal fin generally emarginate, not truncate. Colour varying with the nature of the bottom and the country through which the stream passes. They are generally coarse and dark where the streams are choked with heavy dead timber, as in some places in the River Meander; silvery in gravelly bottoms and open country, as at Simmons' Plains; and especially so those which have formed the habit of entering the brackish water about the wharves in Launceston.

## Fam. XXXII. GALAXIDÆ.

116. GALAXIAS TRUTTACEUS, Cuv. & Val. (T.) *Spotted Trout.***

B. 9. D. 11. A. 14 - 15. V. 7. P. 14.

Günth. Cat., VI., p. 209. Allp. MS. Macl. Cat., 841.

*Abundant in* most of our freshwater streams, but not descend*ing to brackish* water like *G. attenuatus*.

Government Statistician's Office,
Hobart, 25 May 1894

Dear Mr McClymont

I have been so busy that I have allowed myself to forget all about your little fish until today. On examination I was surprised to find that it exactly corresponds with a form of Galaxias occurring in the Mersey, which I named G. Weedoni or Mersey Jolly Tail many years ago.

It is interesting to find this marbled form also in the fresh water streams of the Peninsula. What stream or streams does it there inhabit,

With kind regard

Yours sincerely

R M Johnston

J. R. M'Clymont M.A.
Koonya.

There are two or three varieties:—

Var. *a*.—In the North Esk, without the three characteristic cross-bars upon shoulder.

Var. *b*, Mountain Trout.—Without spots or bars; head more depressed. Colour, grey, with beautiful iridescent specks of green and gold. Mount Wellington.

Var. *c*.—A red-finned variety, found in streams at Gould's Country.

Although not large they are highly prized for the table, and often afford sport to the angler.

117. **Galaxias auratus**, nov. sp. *Lake Trout.***

B. 9. D. 11-12. A. 14. P. 16. V. 1·7.

The height of the body is contained five times in the total length; the length of head nearly four times. The head is very much depressed. Interorbital space wide, having three pairs of pores over each eye. About seventy distinct pores, mostly in pairs, along usual course of lateral line. Head blackish. Body of a bright transparent golden hue. Spots very large, rounded, and sometimes confluent above lateral line. No blackish bars across shoulder. Ventrals tipped with black; base and tips of anal and dorsal blackish. Pectoral reaches to half the distance from root of ventral. Total length, 9¾ in.; body, 8¼ in.; head, 2¼ in.; snout, ¾ in.; depth, 2 in. nearly; interorbital space, 1 in. nearly. This species is confined to the neighbourhood of the Great Lake, at an altitude of about 4000 feet. It attains a larger size than any other member of the genus.

118. **Galaxias attenuatus**, Jenyns. (A.Z.) *The Jolly-tail.***

D. 12. A. 16. P. 12. V. 7.

Günth. Cat., VI., p. 211. Allp. MS. Macl. Cat., 844.

Abundant in all freshwater streams, entering brackish water in vast numbers. Are highly esteemed as a delicacy for the table.

119. **Galaxias Weedoni**, nov. sp. *Mersey Jolly-tail.**

D. 11. A. 14. P. 15.

Body somewhat compressed. Length of head scarcely exceeding the depth of body, and contained four and a half times in the total length. Pectoral reaches half the distance to root of ventral. Head and body brownish black; back and sides marbled with irregularly transverse wedge-shaped streaks, and bands of darker hue. Caudal bifurcate.

Length, 4½ inches. Mersey River. The finer head and more compressed form, together with marbled sides, distinguish this species from its closely allied congener.

120. **Galaxias Atkinsoni**, nov. sp. *Pieman Jolly-tail.**

B. 9. D. 11. P. 13. A. 14. V. 8.

Length four and one-third times that of the head, and the latter is equal to one and a half times the height of body. Diameter of eye equal to length of snout, and about one-fourth the length of head. Length of pectoral more than one-half the distance to the root of ventral. The depth of peduncle is not half as long as the distance between caudal and dorsal fins. Colour darkish brown. Sides with sixteen to eighteen regular transverse bands of a deeper shade composed of microscopic dots. These bands are less defined towards tail, and are rather wider than the interspaces. Larger dots are distributed along the lines of vertebræ and ribs. Specimen 2¼ inches long. Pieman River (Atkinson).

### Fam. XXXIII. SCOMBRESOCIDÆ.

121. **Hemirhamphus intermedius**, Cant. (A.Z.) *The Garfish.***

D. 15-17. A. 18-20. P. 11.

Günth. Cat., VI., p. 260, Allp. MS. Macl. Cat., 867.

Abundant during the summer months, and caught largely in seine-nets in our estuaries. They are valuable market fish, although it is to be regretted that their mode of capture by the seine-net appears to commit great havoc among the young of other valuable food fishes.

### Fam. XXXIV. CYPRINIDÆ.

122. **Carassius vulgaris**, Nilsson. (I.) *The European Carp.*

123. **Carassius auratus**, L. (I.) *Gold Fish.*

124. **Tinca vulgaris**, Cuv. (I.) *English Tench.*

### Fam. XXXV. GONORHYNCHIDÆ.

125. **Gonorhynchus Greyi**, Rich. (A.Z.) *Sand Eel.* *

B. 4. D. 11-13. A. 9. V. 9. Cæc. pylor. 6-9.

Günth. Cat., VII., p. 373. Allp. MS. Macl. Cat., 883.

Not uncommon in the Derwent.

### Fam. XXXVI. CLUPEIDÆ.

126. **Engraulis encrasicholus** *(var. antipodum)*, L. *The Anchovy.**

B. 12-13. D. 16-17. A. 18-20. L. lat. 48-50. Vert. 46-47.

Günth. Cat., VII., p. 385. Allp. MS. Macl. Cat., 885. *(Antarticus.)*

Abundant; frequently entering rivers Derwent, Tamar, and Huon.

It is surprising that no effort has been made locally to utilise this valuable fish. Fishermen can have no interest in attempting to capture the shoals seen frequently by them towards the mouth of the Derwent, so long as there is an absence of proper curing establishments. Hobart *is very favourably situated as a centre for a fishing industry of this kind.*

127. Clupea sprattus, L. (E.) *The Sprat.**

B. 6 - 7. D. 15 - 18. A. 17 - 20. V. 7. L. lat. 47 - 48. Vert. 47 - 49.

Günth. Cat., VII., p. 419. Proc. Zool. Soc., 1871, p. 672. Allp. MS. Macl. Cat., 899.

Large shoals of these fish are observed by the fishermen to pass along the coasts at certain seasons, attended usually by their rapacious enemies, the Barracouta and Kingfish. Small numbers ascend the Tamar as far as Launceston during March each year. Sometimes the main body mistakes its course, as in 1844, when the Sprats entered the Derwent in immense numbers. The late Mr. Calder gave a description of an immense shoal which had been driven ashore and suffocated, in Simmons' Cove, Bruni Island, in 1867 (Proc. Roy. Soc. Tas., May, 1867). In speaking of the mass of fish thus destroyed at one time, he estimated that there was not less than three hundred tons, which he reckoned would amount to forty-three million eight thousand individual fishes. Dr. Günther, in quoting this instance, urges that "attempts ought to be made to utilise the Tasmanian Anchovy and Sprat in the same way as it is done in Europe." The Sprat does not seem to visit the Australian coasts.

128. Clupea sagax, Jenyns. *The Pilchard.* (A.)

B. 7. D. 18. A. 18 - 19. L. lat. 50 - 54. L. tr. 13.

A series of more or less distinct blackish spots along the side.

Günth. Cat., VII., p. 443. Allp. MS. Macl. Cat., 890.

Not so common as the sprat. Tasmania (Allport).

### Fam. XXXVII. SYMBRANCHIDÆ.

129. Chilobranchus dorsalis, Rich. (A.)

Paired fins none. Vertical fins rudimentary. Colour blackish brown, with a median dorsal line.

Günth. Cat., VII., p. 18. Allp. MS. Macl. Cat., 908.

Tasmanian specimens 90 mil. long. (Gunn and Günther.)

130. Chilobranchus rufus, Macleay. (A.)

Colour red, with six or seven blue or dark purple spots along each side. Length three inches.

Macl. Cat., 909. Tasmania (Macleay).

### Fam. XXXVIII. MURÆNIDÆ.

131. Anguilla australis, Rich. (A.) *The Common Eel.***

Dorsal fin begins at a short distance in advance of anal.

Günth. Cat. VIII., p. 36. Allp. MS. Macl. Cat., 913.

Abundant in all rivers. Reaches to an immense size in the South Esk River.

132. Conger vulgaris, Cuv. *The Common Conger Eel.***

Dorsal fin begins nearly opposite to extremity of pectoral fin.

Günth. Cat., VIII., p. 38. Allp. MS. Macl. Cat., 918.

*Brought to Hobart* market in considerable quantities.

133. **Conger Wilsoni**, Cast. *Conger Eel.*

Dorsal fin commences behind the extremity of pectoral fin.

Cast., Proc. Zool. Soc. Vic., vol. I., p. 193. Macl. Cat., 914.
Tasmania (Cast).

134. **Muraenichthys breviceps**, Günth.

Origin of dorsal twice as distant from vent as from gill-opening.

Günth. Ann. and Mag. Nat. Hist., 1876, v. XVII., p. 401.
Allp. MS. Macl. Cat., 922.
Rare. Tasmania (Allport).

135. **Congromuraena habbenata**, Rich. (A. Z.) *Silver Eel.*

Upper jaw much projecting beyond lower. Dorsal commences immediately behind the pectoral.

Günth. Cat., VIII., p. 42. Macl. Cat., 916.
Rare. One specimen in Roy. Soc. Museum, caught in the Derwent.

## Fam. XXXIX. PEGASIDÆ.

136. **Pegasus lancifer**, Kaup.

D. 5. A. 5. P. 15. V. 2.
Günth. Cat., VIII., p. 149. Allp. MS. Macl. Cat., 946.
Not uncommon in the Derwent.

## Fam. XL. SYNGNATHIDÆ.

137. **Syngnathus semifasciatus**, Günth. (A.) *Pipe Fish.*

D. 38. Osseous rings, 21 + 49.
Günth. Cat., VIII., p. 162. Allp. MS. Macl. Cat., 947.
Not uncommon.

138. **Stigmatophora argus**, Rich. (A.) *Pipe Fish.*

D. 49 - 52. Osseous rings, 20 + about 75.
Günth. Cat., VIII., p. 189. Allp. MS. Macl. Cat., 965.
Common.

139. **Stigmatophora nigra**, Kaup. (A.) *Pipe Fish.*

D. 39 - 40. Osseous rings, 17 + about 72.
Günth. Cat., VIII., p. 190. Macl. Cat., 966.
Enters the Tamar occasionally.

140. **Stigmatophora gracilis**, Macleay. (T.) *Pipe Fish.*

D. 58. Osseous rings, 20 + 56.
Macl. Cat., 970. Length, 5 inches. Tasmania (Macleay).

141. **Solenognathus spinosissimus**, Günth. *Pipe Fish.*

D. 35. Osseous rings, 27 + 55.
Günth. Cat., VIII., p. 195. Allp. MS. Macl. Cat., 973.
Common, Derwent.

142. **Phyllopteryx foliatus**, Shaw. (A.)

D. 30. Osseous rings, 18 + 35.
*Günth.* Cat., VIII., p. 196. Allp. MS. Macl., 974.
*Common.*

143. **Hippocampus abdominalis**, Kaup. (T.) *Sea-horse.*
D. 28 - 31.
Günth. Cat., VIII., p. 199. Allp. MS. Macl. Cat., 978.
Abundant.

144. **Hippocampus breviceps**, Peters. *Yellow-ringed Sea-horse.*
D. 19 - 21, standing on five rings.
Günth. Cat., VIII., p. 200. Allp. MS. Macl. Cat., 980.
Common.

## Fam. XLI. SCLERODERMI.

145. **Monocanthus Gunnii**, Günth. *Dark Brown Leather-jacket.*
D. 34. A. 33. Skin velvety, dark brown, mottled with black.
Günth. Cat., VIII., p. 247. Allp. MS. Macl. Cat., 993.
Common.

146. **Monocanthus convexirostris**, Günth. *Grey Leather-jacket.*
D. 34 - 37. A. 32 - 35. Small spiny distinct scales.
Günth. Cat., XIII., p. 248. Allp. MS. Macl. Cat., 994.
Common.

147. **Monocanthus Peronii**, Holland. *Pale brown Leather-jacket.*
D. 33 - 35. A. 33. Scales spine-like, with swollen tips like a mushroom.
Günth. Cat., VIII., p. 249. Allp. MS. Macl. Cat., 997. (Güntheri ?).
Common.

148. **Monocanthus Guntheri**, Macleay, (M. Peronii, Holland).
Macl. Cat., 998.

149. **Monocanthus spilomelanurus**, Quoy & Gaim. (A.) *Golden-streaked Eye Leather-jacket.*
D. 30 - 32. A. 28 - 32.
Günth. Cat., VIII., p. 250. Allp. MS. Macl. Cat., 1000.
Common, Sandy Bay.

150. **Monocanthus maculosus**, Rich. (A.) *Small brown Leather-jacket.*
D. 29 - 33. A. 29 - 30. P. 12.
Günth. Cat., VIII., p. 25. Allp. MS. Macl. Cat., 1001.

151. **Monocanthus Baudini**, Cast. (A) *Lozenge-scaled Leather-jacket.*
D. 35. A. 31. P. 13. C. 8. Scales lozenge-shaped, each armed with three or four spinelets.
Proc. Zool. Soc. Vic., Vol. II., page 55. Macl. Cat., 1007.
Tasmania (Cast).

152. **MONOCANTHUS MELAS**, Günth. *Black Leather-jacket.*
D. 34. A. 34. Colour brownish black; two whitish bands across chin.
Günth. Ann. and Mag. Nat. Hist., 1876, vol. XVII., p. 402. Allp. MS. Macl. Cat., 1014.
Tasmania (Allport).

153. **MONOCANTHUS RUDIS**, Rich. *White-banded Leather-jacket.*
D. 34 - 35. A. 34. Brown, uniform or with four indistinct broad, whitish, longitudinal bands.
Günth. Cat., VIII., p. 244. Allp. MS. Macl. Cat., 1020.
Common.

154. **MONOCANTHUS HIPPOCREPIS**, Quoy and Gaim. *Blue-banded Leather-jacket.*
D. 35 - 37. A. 33 - 36. Brown, with undulated bluish bands on the snout and along the lower side.
Günth. Cat., VIII., p. 246. Allp. MS. Macl. Cat., 992.

155. **OSTRACION AURITUS**, Shaw. *Trunk-fish.*
Spines, 1 above hind part of orbit, pointing backward.
Günth. Cat., VIII., p. 266. Allp. MS. Macl. Cat., 1036.
Common.

156. **OSTRACION ORNATUS**, Gray. *Yellow-striped Trunk-fish.*
Spine, 1 above middle of orbit, nearly erect, pointing up and out.
Günth. Cat., VIII., p. 267. Allp. MS. Macl. Cat., 1037.
Common.

### Fam. XLII. GYMNODONTES.

157. **TETRODON HAMILTONI**, Rich. *Toad Fish.*
Back and abdomen covered with minute spines; back and sides marbled with roundish dark brown blotches.
Günth. Cat., VIII., p. 280. Allp. MS. Macl. Cat., 1045.
Common. This globe-fish is stated to be highly poisonous taken as food. It is abundant, entering fresh water at Cataract Bridge on the Tamar.

158. **TETRODON RICHEI**, Freminv. *Globe Fish.*
Body densely covered with minute spines; light brown above, lower parts uniform white.
Günth. Cat., VIII., p. 285. Allp. MS. Macl. Cat., 1046.
Common in all our estuaries. They inflate their bodies and emit singular sounds when being captured. When inflated the belly floats uppermost.

159. **CHILOMYCTERUS JACULIFERUS**, Cuv. (A.) *Porcupine Fish.*
D. 16. A. 15. P. 19. C. 9.
Three black spots on each side of the body; jaws without median suture; only 5 spines, in a straight longitudinal series from parietal spine to side of dorsal fin.
Günth. Cat., VIII., p. 318. Macl. Cat., 1063.
*Common.*

160. **Atopomycterus nychthemerus**, Cuv. *Slender-spined Porcupine Fish.*

All the spines slender, without ridge; upper part of tail without spine; snout to dorsal, 13 spines in transverse series.

Günth. Cat., VIII., p. 315. Allp. MS. Macl. Cat., 1065.

161. **Orthagoriscus mola**, L. *Sun Fish.*

D. 17-18. A. 14-17. C. 12-16. P. 12-13. Vert. 10-7.

Günth. Cat. VIII., p. 317. Allp. MS. Macl. Cat., 1066.

Captured occasionally.

## Sub-class II. Chondropterygii.

### Fam. XLIII. CHIMÆRIDÆ.

162. **Callorhynchus antarticus**, Lacep. *The Elephant Fish·*

Snout with a cartilaginous prominence terminating in a cutaneous flap.

Günth. Cat., VIII., p. 351. Allp. MS. Macl. Cat., 1070.

Common in the estuaries of the Derwent and Tamar.

### Fam. XLIV. CARCHARIDÆ.

(Eye with a nictitating membrane, an anal fin, two dorsals.)

163. **Carcharias glaucus**, L. (E.) *The Blue Shark.*

An anal fin. Teeth serrated, those of upper jaw oblique. First dorsal opposite to space between pectoral and ventral fins. Without spine. Mouth inferior.

Günth. Cat., VIII., p. 353. Allp. MS. Macl. Cat., 1074.

Common.

164. **Galeus canis**, Rondel. (E.) *The Tope.*

Teeth, 34 : 34. The second dorsal fin is only one-third of the size of the first, and somewhat in advance of anal.

Günth. Cat., VIII., 379. Allp. MS. Macl. Cat., 1079. *(Australis.)*

Mr. Macleay is of opinion that the Australian form is specifically distinct from the European form. It is termed the "School Shark" by the Port Jackson fishermen. Length about six feet.

165. **Zygæna malleus**, Shaw. (E.) *The Hammer-headed Shark.*

The length of the hinder margin of one side of the hammer is nearly equal to its width near the eye.

Günth. Cat., VIII., p. 381. Allp. MS. Macl. Cat., 1080.

166. **Mustelus antarticus**, Günth. (A.)

Origin of dorsal fin behind the inner posterior angle of pectoral. No spine. Teeth small, numerous, similar in both jaws, arranged like pavement, obtuse or with very indistinct cusps.

Günth. Cat., VIII., p. 387. Allp. MS. Macl. Cat., 1081.

Common.

### Fam. XLV. LAMNIDÆ.

(No nictitating membrane. An anal fin. Two dorsals, the first opposite to the space between pectorals and ventrals. Nostrils not confluent with the mouth, which is inferior. Spiracles none, or minute.)

167. LAMNA CORNUBICA, Flem. *Porbeagle* or *Blue Shark.*

Teeth 13 - 16 : 12 - 14. Lanceolate, not serrated. Third tooth either side upper jaw small.

Günth. Cat., VIII., p. 389. Allp. MS. Tasmania (Allport.)

168. ODONTASPIS AMERICANUS, Mitch. (A.) *The Grey Nurse.*

Teeth large, awl-shaped, with small additional basal cusps.

Günth. Cat., VIII., p. 392. Allp. MS. Macl. Cat., 1084.

Not uncommon. Length, 10 feet.

169. ALOPECIAS VULPES, L.

Teeth of moderate size, triangular, not serrated. Third tooth upper jaw smallest.

Günth. Cat., VIII., p. 393. Allp. MS. Macl. Cat., 1085.

Tasmania (Allport). Length, seven feet.

### Fam. XLVI. NOTIDANIDÆ.

170. NOTIDANUS INDICUS, Cuv.

One dorsal fin only, without spine, opposite to the anal. A single median pointed tooth in upper jaw. Lower tooth with lateral cusps only.

Günth Cat., VIII., p. 398. Allp. MS. Macl. Cat., 1086.

Tasmania (Allport). Length, five feet.

### Fam. XLVII. SCYLLIDÆ.

(No nictitating membrane. The first dorsal fin above or below the ventrals. An anal fin. Mouth inferior. Teeth small, several series being generally in function.)

171. SCYLLIUM MACULATUM, Bl.

Teeth of the lower jaw of moderate size, with a long median cusp, and a pair of small cusps on each side. Brownish above and below, with scattered brown spots. Nasal valves confluent.

Günth. Cat., VIII., p. 401. Macl. Cat., 1087.

Length, two feet. Doubtful.

172. SCYLLIUM LATICEPS, Dum.

Teeth very small tricuspid. Nasal valves not confluent, separated by a broad interspace. Brownish, marbled with darker.

Günth. Cat., VIII., p. 404. Allp. MS. Macl. Cat., 1088.

Tasmania (Allport).

173. PARASCYLLIUM VARIOLATUM, Dum.

Teeth small lanceolate, only those of lower jaw with indistinct lateral cusps. The two dorsal fins subequal, the first *distant from* root of ventral. Anal entirely in advance of second dorsal. Dark brown above, with more or less distinct black spots.

Günth. Cat., VIII., p. 410. Allp. MS. Macl. Cat.

Tasmania (Allport). Length, two to three feet.

174. Crossorhinus barbatus, L. *Wobbigong.*

Spiracles wide, oblique slits side of head, with skinny appendages (about seven). Upper parts brown, marbled with grey. A whitish spot behind the spiracle.

Günth. Cat., VIII., p. 414. Allp. MS. Macl. Cat., 1095.

Common. Length, five to seven feet.

### Fam. XLVIII. CESTRACIONIDÆ.

(No nictitating membrane. Two dorsal fins, the first opposite to the space between pectoral and ventral fins. An anal. Nasal and buccal cavities confluent. Teeth obtuse, several series being in function. Padlike.)

175. Heterodontus Phillipii, Lacep. *Port Jackson* or *Bull-head Shark.*

Günth. Cat., VIII., p. 415 (Cestracion). Allp. MS. Macl. Cat., 1097.

Common in the Derwent and Tamar. Known to the fishermen by the name of Bull-head Shark.

### Fam. XLIX. SPINACIDÆ.

(No nictitating membrane. No anal fin. Pectorals not notched at their root. Snout with lateral armature. Each dorsal with a spine.)

176. Acanthias vulgaris, Risso. (A.) *Spotted Spiny Dog.*

Origin of dorsal opposite or behind the inner posterior angle of pectoral.

Günth. Cat., VIII., p. 418. Allp. MS. Macl. Cat., 1099.

Very abundant.

177. Acanthias Blainvillii, Risso. (A.) *Spiny Dog.*

First dorsal conspicuously in advance of the inner posterior angle of pectoral.

Günth. Cat., VIII., p. 419. Allp. MS. Macl. Cat., 1100.

Abundant. Scarcely distinct from *A. vulgaris.*

### Fam. L. RHINIDÆ.

(No anal fin. Pectorals deeply notched in front at the root.)

178. Rhina squatina, L. *The Angel Shark.*

Mouth anterior. Pectoral fins large, expanded, in the plane of the body.

Gunth. Cat., VIII., p. 430. Allp. MS. Macl. Cat., 1102.

Common.

### Fam. LI. PRISTIOPHORIDÆ.

(Snout much produced, with lateral teeth, saw-like.)

179. PRISTIOPHORUS CIRRATUS, Latham. (A.) *Saw Fish.*
Sets of teeth in upper jaw, 42.
Günth. Cat., VIII., p. 432. Allp. MS. Macl. Cat., 1104.
Not common.

180. PRISTIOPHORUS NUDIPINNIS, Günth. (A.) *Saw Fish.*
Sets of teeth in upper jaw, 35 - 39.

### SECOND SUB-ORDER *BATOIDEI.* *(Rays.)*

(Body depressed. Gill-openings ventral. Tail long. No anal fin. Dorsal fin, if present, on the tail.)

### Fam. LII. RHINOBATIDÆ.

(Trunk passing gradually into the strong and long tail, which is provided with two dorsal fins and a caudal. Pectorals not extending to the snout.)

181. TRYGONORHINA FASCIATA, Mull and Henle. *The Fiddler.*
A series of obtuse distant tubercles along the median line of the back.
Günth. Cat., VIII., p. 400. Allp. MS. Macl. Cat., 1111.
Not uncommon.

### Fam. LIII. TORPEDINIDÆ.

(Trunk a broad smooth disc. Rayed dorsal and caudal fins generally present. An electric organ.)

182. NARCINE TASMANIENSIS, Rich. *Electric Torpedo.*
Disc elliptical. Colour brownish.
Günth. Cat., VIII., p. 452. Allp. MS. Macl. Cat., 1112.
Length up to six feet. Not common.

### Fam. LIV. RAJIDÆ.

(Disc broad, rhombic, generally rough. Tail with a longitudinal fold on each side. Pectorals extending to the snout. No electric organ. No serrated caudal spine.)

183. RAJA LEMPRIERI, Rich. *Thorn-back.*
Spines on the superciliary edge, on the mesial line, between head and humeral cartilage, and a row down middle of tail directed alternately left and right.
Günth. Cat. VIII., p. 463. Allp. MS. Macl. Cat., 1114.
Common.

### Fam. LV. TRYGONIDÆ.

(Pectoral fins uninterruptedly continued to and confluent at the extremity of snout. Tail armed with spine, but *without lateral longitudinal* folds.)

184. **Urolophus cruciatus**, Lacep. *Stingaree.*
Yellowish uniform, or with one or three blackish longitudinal bands, crossed by others of same colour.
Günth. Cat., VIII., p. 486. Allp. MS. Macl. Cat., 1121.
Abundant in the mud-flats of land-locked bays.

### Fam. LVI. MYLIOBATIDÆ.

(Sides of the head free from the pectoral fins; snout with a detached pair of cephalic fins.)

185. **Myliobatis aquila**, L. *Eagle* or *Whip-tail Ray.*
Median teeth of upper jaw four to six times as broad as long.
Günth. Cat., VIII., p. 489. Allp. MS. Macl. Cat., 1122.
Tasmania (Allport).

## Sub-class Cyclostomata.

### Fam. LVII. PETROMYZONTIDÆ.

186. **Mordacia mordax**, Rich. (A.) *Common Lamprey.*
Body eel-shaped. Sectional disc elliptic, with a free lip behind. The first dorsal distant from second.
Günth. Cat., VIII., p. 507. Allp. MS. Macl. Cat., 1127.
Abundant at certain seasons, clinging to the sides of perpendicular rocks under mill-shoots, Cataract Gorge, North Esk, Launceston.

187. **Geotria Allporti**, Günth. *The Pouched Lamprey.*
Günth., Proc. Zool. Soc. 1871, p. 675. Allp. MS. Macl. Cat., 1131.
Not uncommon in fresh water, Derwent, North Esk, St. Leonard's.

## Sub-class Leptocardii.

### Fam. LVIII. CIRROSTOMI.

188. **Branchiostoma lanceolatum**, Pall. *The Lancelet.*
Transparent; slightly iridiscent.
Günth. Cat., VIII., p. 513. Allp. MS. Macl. Cat., 1133.
Tasmania (Allport).

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# ADDENDA.

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**The following were described or came under notice during the publication of this work.**

1. **LOPHOTES GUNTHERI**, Johnston.

B. 6. D. 221+36. A. 6·14. P. 14. V. 1·5.
L. lat. 208. Reticulate markings.
Johnston, (Proc. Roy. Soc. Tas., 1882.)

Rare.

2. **CHILODACTYLUS MULHALLI?** Macleay. *The Butter Fish.*

B. 6. D. 15 : 1·25. A. 3·9. V. 1·5.
L. lat. 53. L. tr. 6·16.

Length of head nearly equal to depth of body, and contained four and a-half times in total length. Fifth, sixth, and seventh spine of dorsal longest. Body elongate, and somewhat rounded. Mouth protractile. No teeth on vomer or palatines. Villiform teeth on jaws. Opercles covered with small scales. Scales on body three quarters of an inch square, with margins darker and reduced to a flaccid membrane. Pectoral composed of eight branched and six simple rays, the second of the latter longest, and reaching to a vertical drawn through thirteenth spine. Uniform brownish black. Total length, 29 inches.

I have referred this species doubtfully to *C. Mulhalli*, Macleay. It appears to agree with the species named in every respect, with the exception of the number of anal spines,—the Sydney species having 2, and the Tasmanian 3. It would be well to examine a greater number of specimens to ascertain if this feature be constant.

3. **APOGON LEMPRIERI**, nov. sp.

B. 7. D. 6 : 1·10. A. 2·9. L. lat. 27. L. tr. 3·10.

The height of body is equal to length of head, and is contained nearly three times in the total length. Snout short; length about half the diameter of eye, which latter is fully one-third of the length of the head. The maxillary scarcely reaches to the vertical from the posterior margin of eye. Lower jaw prominent. Two minute cavities on upper part of snout. Hinder margin of præoperculum minutely dentate. Anterior ridge simple. Spine of operculum reduced to a soft pointed membrane. No dark spots on root of caudal.

Uniformly brownish, with iridescent shades of purple, gold, and light blue; lighter towards belly. Tips of ventral and dorsal fins blackish. Other fins light reddish.

*Total* length of specimen caught at Dunkley's Point, *Sandy Bay*, 4 inches.

*Measurement*—

| | |
|---|---|
| Total length | 4 inches. |
| Length of body | 3⅛ „ |
| Head | 1⅜ „ |
| Greatest depth | 1⅜ „ |
| Diameter of eye | 11 mil. |
| Length of snout | 5 „ |
| Anterior dorsal, 1st spine | 7 mil. long. |
| „ 2nd spine | 16 „ |
| „ 3rd spine | 15 „ |
| „ 4th spine | 13 „ |
| „ 5th spine | 8 „ |
| „ 6th spine | 3 „ |
| Posterior dorsal, 1st spine | 13 „ |
| Longest ray, ditto | 19 „ |
| Longest ray of anal fin | 19 „ |
| 1st spine ditto | 3 „ |
| 2nd spine ditto | 19 „ |
| Longest ray of ventral fin | 21 „ |

4. GOBIESOX CARDINALIS, Ramsay.

D. 8. A. 6. V. 4. P. 22.

Proc. Linn. Soc. N.S.W., vol. VII., p. 148.

5. CORYPHÆNOIDES TASMANIÆ (nov. sp.), *Tasmanian Whiptail.*

B. 7. D. 15 : 103. A. 90 (?). V. 8.

Snout short and obtuse, not projecting beyond mouth. Length nearly six times that of the head, which latter is longer than the greatest depth of body, and measures three times the length of snout. Diameter of eye scarcely equal to length of snout. Barbel rudimentary. Scales small, smooth, without ridges or spines. There are eight series of scales between anterior dorsal and the lateral line. The lateral line is composed of about 133 series of scales, the pierced scales being interrupted. First dorsal is composed of 15 feeble jointed rays, the length about twice the diameter of eye. The second dorsal commences near to the termination of first dorsal. The anus is situate under the 17th ray of second dorsal, and nearer to snout than to tail by twice the length of snout. Uniform silvery plumbous, with a purplish shade. Observed in schools at certain seasons, between Port Davey and Macquarie Harbour, and enters the Derwent occasionally. The specimen from which the description has been taken was captured at Kangaroo Bluff by Dr. Graham. Total length, 15½ inches.

It is very probable that *C. denticulatus*, Rich, which is found on the South Australian and New Zealand coasts, also inhabits Tasmanian waters. The latter species is distinguished from *that now described* by having 11 rays in first dorsal, and five series of scales between the anterior dorsal and lateral line. *C. variabilis*, Gunth., is closely allied, but the latter has the second dorsal distant from the first; the scales have fine ridges, and each ridge is composed of several spines.

### *Bibliography.*

REV. J. E. TENISON WOODS, F.L.S., &c.:
Fish and Fisheries of New South Wales. Sydney, 1882. (213 pp.)

### *ERRATA.*

Pp. 86, 105, and 121, *for* Blennidæ *read* Blenniidæ.

## NOTE AND DESCRIPTION OF THE FIRST DISCOVERED REPRESENTATIVE OF THE GENUS *PUPA* IN TASMANIA.

By R. M. JOHNSTON, F.L.S., etc.

[*Read* 17*th April*, 1882.]

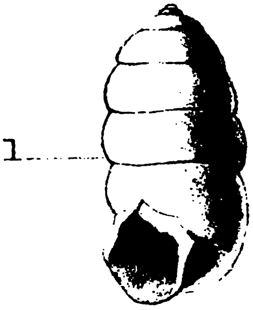
PUPA, *Draparnaud.*

Animal short, stout, acute behind, its upper tentacles developed, its lower ones short, or almost obsolete. Shell oblong-cylindrical, many whorled, often rather thick, mostly ribbed, sometimes deeply umbilicated, generally rather obtuse at the apex; aperture somewhat squarely ovate, generally more or less toothed; lip thickly reflected.

PUPA LINCOLNENSIS, *Angas.*
*Pupa Tasmanica*, R. M. Johnston.

Shell minute, sinistral, thin, of a uniform light fawn colour, sub-pellucid, oblong-cylindrical, obliquely finely lirate; suture somewhat impressed; spire scarcely contracted towards apex, which is suddenly obtusely rounded; whorls, 6, slightly convex; aperture somewhat squarely ovate, subvertical, with a moderately prominent tooth; peristome simple, margins distant, united by a callous lamina; anterior and columellar margins slightly reflexed. Length, 3 mil.; diam., 1·75 mil. Habitat, sand dunes, Swansea. Abundant.

This interesting species was obtained by me recently in great numbers in the shallow depressions of the sand dunes, where the bleached dead shells were lodged by the action of the wind. They were associated with *Helix Furneauxensis*, Petterd;



UM

Pupa lincolnensis, (Angas.)

MU

*H. pictilis*, Tate; *H. Stanleyensis*, Petterd; *Bulimus Dufresni*, Leach; and *B. Tasmanicus*, Pfr. The last mentioned species was found in abundance upon the leaves of *Xerotes longifolia*, where, no doubt, among the roots the living specimens of *Pupa Lincolnensis* may be found. The name P. Tasmanica, first given to the shell, has been withdrawn, as on comparison with Angas' *P. Lincolnensis*, kindly given me by Mr. Petterd, I found that the Tasmanian form was not specifically distinct from it.

Hitherto conchologists were of opinion that the genus *Pupa* had no representatives in Tasmania. The discovery of the first representative will, therefore, be of more than usual interest to local naturalists.

Hobart,
December 12, 1881.

## ON THE STATE OF THE SURVEYS IN TASMANIA.

By G. McIntyre, Authorised and Licensed Surveyor,
Christchurch, New Zealand.

[*Read 9th May*, 1882.]

At recent meetings of the Royal Society the question of the present state of the surveys in Tasmania and the best methods to be adopted for placing them upon a sound basis was under discussion, and various suggestions were made on the subject. Subsequently, on the 27th October, a letter was published in *The Mercury* under the heading "Field Surveyors," which was intended as a reply to the unfavourable comments which had been made upon the existing survey system. This letter was signed by Mr. J. E. Calder, a gentleman who for several years held the office of Surveyor-General for Tasmania, and is therefore entitled to consideration as dealing with a subject with which it is only reasonable to assume he is well acquainted. Statements, however, are made and reasonings adopted which are open to criticism; while the general impression conveyed to the mind of the unprofessional reader amounts to this:—That the surveys of Tasmania are as good as it is possible to make them in a timbered and rugged country, and that a trigonometrical survey is practically useless.

A system of survey for a large extent of country cannot be considered as in any degree accurate or reliable, unless it is based upon a reference to the True Meridian, which is constant and not subject to the fluctuations and uncertainties attaching, even under the most favourable circumstances, to the Magnetic Meridian. It is obvious that an unalterable meridian to which all bearings are referred, is, in itself, and apart from any triangulation, of very great value; and when, in addition, the sectional surveys are connected with the stations of a trigonometrical survey, whose relative positions have been accurately determined, a means is afforded by which the boundaries of such sections can be re-established in case of dispute or of obliteration. Such a system is in force in New Zealand and in some of the other colonies—Victoria and West Australia, for example. An accurate triangulation is recognised as an essential and indispensable basis. With this triangulation, sectional surveys are connected, and the position of each peg is tabulated relatively to some trigonometrical station. The limit of error allowed for minor triangulation is two links in the mile, and for sectional work eight links in the mile, the great majority of the surveys executed under this system being actually much within the limit. The true meridian for each meridianal circuit, and which governs the triangulations, is observed as the astronomical station of the circuit. Under a correct minor triangulation, the accumulation of errors inseparable from a system of mere traverse surveys built up the one upon the other, and which in a large extent of country must be very considerable, even where the traverse surveys are carefully executed, is avoided, and the error is not carried forward, but is confined to the country between the trigonometrical stations. The actual error in any circuit traverse, or in a traverse from one trigonometrical station to another, is easily computable by the solution of a series of right-angled triangles, each traverse line being the hypotenuse, and the bearing supplying the angle.

The system in force in Tasmania, looked at from any point of view, must be regarded as extremely faulty, inasmuch as :—

(1.) It is not based upon triangulation.

(2.) The sectional surveys are built up one upon the other, across large areas of country.

(3.) The surveys are not subject to any mathematical check, such as is afforded by a reduction of the traverses to their co-ordinates on the meridian and perpendicular.

(4.) There is no systematic field inspection.

(5.) The limit of error allowed is so great as to preclude anything like accuracy; the confusion and discrepancies arising from this source alone rendering it impossible to re-establish boundaries, even where an admitted starting point is available, within more than a rough approximation.

(6.) In the cities and towns there are no standard survey *lines laid down from* which to define the true frontage lines of blocks, and with which to connect the various town surveys required from time to time under the Real Property Act.

(7.) The surveys are made to independent magnetic meridians, the bearings of the initial line in each survey being derived from the compass or needle-reading.

(8.) The office plans and compilations are constructed entirely upon the "building-up" system, without the check afforded by the connection of surveys with accurately determined trigonometrical stations.

With regard to sub-section (7) above, it is perhaps right to note that an independent or isolated survey, executed under the method therein indicated, may be extremely accurate in itself, that is within its own boundaries; but it is obvious that the surveys, effected by a number of surveyors, working to their own independent compass meridians, which, even apart from special local attraction, are certain to vary considerably—cannot be properly compared as to boundaries and relative positions, and are therefore "floating" to an extent which is unknown and practically unlimited.

With respect to sub-section (5), it is not unreasonable to assume that where a certain limit of error is recognised, a considerable proportion of the surveys, especially in rough country, will come nearly up to that limit. The limit of error formerly allowed in Tasmania, and probably still recognised, was 32 links in the mile (1 in 250), a limit three times greater than a fair allowance. A limit of error of 8 links in the mile (1 in 1,000) for ordinary sectional work, is regarded as a maximum allowance under any system professing to give reasonably accurate results.

The statements made by Mr. Calder in the letter above referred to, may be fairly summarised as follows:—

1. That Tasmania is so denseely wooded and rugged that it is impossible to adopt a really accurate and scientific system of survey, and its peculiarities "will for ever enforce peculiar modes of surveying."

2. That the setting aside of the compass meridian in favour of the True Meridian would, on account of obstructions, involve a "delay of several hours a day in the frequent determination of the True Meridian, which would be required of the surveyor, in many districts, every time the boundary line ran into a tree too massive to be removed."

3. That "trees are not to be passed by without liability to error;" and that he has found in practice no "better method of mastering the difficulty than that of observing the compass bearing of the line at the point of obstruction, and then proceeding in the same direction from its opposite side. By this process *the error is not* an increasing one, and though

pretty often repeated in a day's work, will generally not exceed half-a-dozen yards in a mile."

4. That the great errors existing in the maps are really errors of compilation in the office, and not errors of survey in the field.

5. That it is not desirable to undertake the reconstruction of the maps.

6. That the trigonometrical survey executed many years ago was a fraud, and entirely unreliable.

7. That "in the days of field survey inspection" the work of nineteen-twentieths of the surveyors "stood the severest tests that could be applied to it."

It will be convenient to consider these points *seriatim*.

1. Densely-wooded and rugged country.—It is better to show what has been done in other countries, than to advance mere theories; and it can be proved that these obstacles are by no means insuperable. In New Zealand there is to be found as densely-wooded and rugged territory as any that has ever been surveyed in Tasmania, and yet it is found practicable to apply an accurate system throughout. Extracts from the Annual Reports (1880) of some of the chief surveyors will furnish evidence in support of this statement.

The Chief Surveyor for Auckland district says:—"We have in hand at this time 23,000 acres, all of which is situated in the most broken, mountainous, and difficult part of this island." The work of some of the surveyors is "situated in the densely-wooded and precipitous mountains of the East Cape. . . . I wish to state my opinion, based on a 3½ years' trial, that the system of survey . . . has been found to work as well in our forest-clad, broken country of the north, as in the open plains of the south."

In the Wellington district the sectional surveys, amounting to over 93,000 acres, are stated to be "all under forest."

The Chief Surveyor for Nelson speaks of the country, in which a large part of the surveys during the year were situate, as "rugged, mountainous, heavily-timbered, with dense undergrowth," and adds, "the bulk of applications to be surveyed are in isolated sections, or in small groups . . . in many cases only accessible by rough bush packtracks. . . . . . Mining surveys in several localities are 3,000ft. and 4,000ft. above sea-level, and generally in bush on rugged mountain sides."

Referring to a portion of the triangulation in Otago, the chief surveyor for that district says, "This work is spread over 30 miles of wild Alpine country, full of bush, and intersected by dangerous snow-fed rivers."

Of the surveys in Southland, the report states that "50 sections, embracing 4,500 acres, were in bush. . . . The gold-mining applications were in densely-timbered broken *country.*"

Enough has been quoted to dispose of the first point advanced by Mr. Calder.

2 and 3. Bush lines and meridian.—One would be led to infer, from the statements made, that the prismatic compass, or the compass attached to the theodolite, afforded the only available method of obtaining the bearings or azimuths of lines, whereas it ought to be taken for granted, as a matter of course, that even in the case of a survey, based upon an independent magnetic meridian, the initial line of the survey was the only one observed by the compass, the bearing thus obtained being transferred to the plate, and all subsequent readings derived therefrom. To whatever meridian the work is done, or from whatever source derived, whether compass or astronomical, the veriest tyro must be aware that the bearings are carried on by the theodolite, and that the proof of accuracy is found in the extent of accordance in the closure, either upon one of the lines of the survey in hand, or at a trigonometrical station. The argument advanced has therefore no foundation either in theory or in practice. If it has been in any degree the practice to make surveys by compass only, it ought to be no matter for surprise if the discrepancies in the various surveys are found to be startling. Still less should those discrepancies be a matter for surprise when we have an authoritative assurance that the most favourable results have been obtained from such a process as running a line by compass bearing to some large tree, and then, after transferring the instrument by guess to a supposed corresponding point on the other side, carrying on the line again by compass bearing; and this not only in an isolated case, but "a dozen or twenty times in every mile." It is also urged that by the mysterious correction of "compensation" the error "will generally not exceed half-a-dozen yards in the mile." Admittedly, therefore, the error may in some cases be much greater; but even what is considered a favourable instance depends entirely upon chance or luck. The errors, it is said, compensate each other to a great extent; but it needs hardly to be stated that the errors may be all the one way—all in the same direction—and then instead of the compensation of errors bringing the net error down to "half-a-dozen yards in the mile," the error may be increased indefinitely.

4 and 5. Errors in maps.—The statements made under this head only furnish an additional condemnation of the system in force. If the surveys are not trigonometrically connected and homogeneous, it is impossible to construct correct general maps, and it need be no matter of surprise that the draftsmen should have failed in the task assigned them, and that the maps are inaccurate. The reconstruction of the maps could only be *undertaken, with any hope* of placing them upon a more

satisfactory basis, concurrently with or subsequent to the field determination of the true relative positions of a number of points in the several districts.

6. Former triangulation useless.—This assertion, even if established, in no way detracts from the advantages of a trigonometrical survey honestly done, and reliable as a basis of detail operations. Nor is there anything in the nature of such a survey to make it a matter of uncertainty or speculation. If funds are forthcoming, the result ought not to be problematical.

7. Field inspection.—It would be interesting to learn what extent of surveys were rejected or condemned "in the days of field inspection." As the "severest tests" recognised a limit of error of 32 links in the mile, the standard of accuracy can hardly be considered high. To keep within the limit specified was one of the conditions of each surveyor's work, and it is obvious, therefore, that only those surveys which were found on traverse inspection to exceed this limit could be condemned. But, further, as there was no triangulation by which to test the surveys on inspection, the inspector's own work would have to be discounted somewhat, and allowing that officer a limit of error of 8 or 10 links in the mile, as it would only be a traverse inspection, it is not beyond the bounds of possibility to assume that he might pass work which was erroneous to the extent of something like 40 links in the mile, or 4in. in every chain.

Apart from general considerations as to the wisdom and propriety of establishing an accurate system of survey, the fact that under the Real Property Act titles are issued for certain pieces of lands, the boundaries whereof are defined in the certificates and guaranteed, renders it not only desirable but essential that the methods of survey and of record should be such as to effectually guard against overlaps of boundaries and consequent future claims and litigation.

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# A DESCRIPTION OF THE REMAINS OF TRILOBITES FROM THE LOWER SILURIAN ROCKS OF THE MERSEY RIVER DISTRICT, TASMANIA.

By R. Etheridge, Jun., F.G.S. (of the Museum of Natural History, London.)

[*Read* 13*th June*, 1882.]

I am indebted to the kindness of Mr. T. Stephens, M.A., *F.G.S., for an* opportunity of examining the fossils which form the subject of the present communication to the Society. They represent two localities and two horizons, geologically speaking. The first and largest parcel, consisting almost wholly of Trilobite remains, is from the Mersey River District, North Tasmania, whilst the other fossils are from a Conglomerate of unknown age at Table Cape. It will perhaps be best to consider the two as distinct from one another; I shall therefore describe them under separate headings.

## 1. TRILOBITES AND OTHER FOSSILS FROM THE MERSEY RIVER DISTRICT.

Plates 1 and 2.

Mr. Stephens recorded the discovery of the beds "containing casts of Trilobites," as long ago as 1874, in a short verbal notice on the subject.* It appears that a number of these specimens were forwarded to Europe and America through the late Rev. W. B. Clarke, and casually examined by my father and Professor L. Lesquereux. In the verbal notice referred to, Mr. Stephens says, quoting from a letter received from Mr. Clarke, "Both Mr. Etheridge and Mr. Lesquereux had identified the genera *Phacops*, *Ogygia*, *Calymene*, and *Conocephalites*, and considered the rock to be the equivalent of the Potsdam Sandstone."

Trilobites do not appear to have been found to any great extent in the Palæozoic rocks of Tasmania. Mr. Charles Gould, some years ago, found impressions of them in the rocks of the Mersey River District,† but I am not aware that any description of these has appeared. In his remarks on the Gordon Limestones, a set of beds probably distinct from those now under consideration, Mr. Gould particularly refers to the absence of Trilobites,‡ although he speaks of certain others, as the "*Calymene* beds of Tasmania."

The matrix consists of a fine-grained, friable, and much decomposed grit, in hand specimens of a bright ochreous colour. The mass is almost exclusively composed of the comminuted remains of Trilobites, in the form of casts, from which the whole of the integument and external parts have disappeared. Mr. Stephens writes me, "It is only in this one spot in Tasmania that Trilobites have been found at all, and here they are only obtainable from this friable jointy matrix, which passes into a hard metamorphic sandstone with brecciated bands, either barren of fossils or utterly refractory." He adds, "I have named this formation the 'Caroline Creek beds,' to prevent any mistake as to locality."

The forms I have been able to distinguish amount to four only, or perhaps five, and this has not been accomplished without considerable difficulty, owing to the comminuted and

* Papers and Proc. R. Soc. Tas. for 1874, p. 27.

† Fide Stephens, *ibid* for 1878, p. 38.

‡ *Ibid* 1866, p 27.

fragmentary nature of the remains. Not a single instance of an entire specimen has occurred, and only one in which one of the free cheeks was attached to other portions of the cephalic shield. The parts of the body usually recognisable are the glabella, the pygidium, occasionally an hypostome, and several free cheeks, with eyes attached. No trace of a complete, or even partially complete, thorax has been observed, and the dismembered thoracic segments are not sufficiently well preserved to admit of description. Under these circumstances, it may be imagined with what difficulty the piecing together of these fragments has been attended.

The genus *Asaphus* is certainly represented by two tails, probably indicative of distinct species. No other portions referable to this genus have been noticed. We meet with portions of a fine head, chiefly the glabella, which I cannot do otherwise than refer to *Conocephalites*, and numerous examples of a free cheek, with eye attached, and long genal spines, which, perhaps, belong to the same genus. A fine pygidium occurs in about equal abundance with the glabella just referred to, possessing all the characters of the peculiar genus *Dikelocephalus*. Now, by their size and association, these two portions, the glabella and tail, should belong to one individual, but we cannot definitely unite them in the face of the different characters appertaining to the respective genera to which they belong. It is strange that out of the large number of specimens examined, no proper tail of a *Conocephalites*, or head of a *Dikelocephalus*, has been observed to complete the two forms. Lastly there are a series of small head shields, all more or less of the same type, but whose generic affinity, owing to their fragmentary condition, must be left an open question for the present. They clearly belong to the Conocephaloid type, and appear to have affinities with certain American genera of Trilobites.

Description of the Species.

Genus CONOCEPHALITES (*Zenker*, 1833). *Barrande*. 1852.

*Obs*. This genus includes Trilobites possessing a semicircular head shield, with a very distinct neck, segment, and furrows. The glabella is conical, attenuates forwards, and is divided by three to four short furrows. The axal grooves are deep and broad; the eyes present or absent, and placed either at the anterior part of the head, beside the angles of the glabella, or near the centre of the side lobes of the head. The course of the facial suture is simple; it commences at the anterior margin of the head shield far out, turns inwards with a curve towards the eye, and then curves towards the post angle and cuts the margin. The pygidium is semicircular, with a 2-8 jointed axis, and slight furrows at the sides.

*The best* descriptions of *Conocephalites* are those by

Barrande and Burmeister. According to their definitions, a very simple and natural group of Trilobites are retained together, two of the essential points being the division of the glabella by three to four short furrows on each side, and the entire margin to the pygidium. In 1863 Professor James Hall re-defined *Conocephalites*,* much enlarged it, and introduced a number of species differing greatly from the European types. In some of these the glabella is quite undivided, in others there are two furrows on each side, whilst again the border of the tail is produced in some into a spine on each side as in *Dikelocephalus*, besides other modifications of structure.

It would be more appropriate, I think, to retain such forms separate from *Conocephalites*, as represented by the European types of the genus *C. Sulzeri* and *C. striatus*. Indeed, Professor Hall admits a difficulty in referring all his species to *Conocephalites*; perhaps the difficulty might be solved by the institution of a new genus for their reception.

A well marked, and not often dwelt-upon character in *Conocephalites*, is the presence of the ocular ridge or eye line. This appears to be present more commonly in those species in which the eyes are placed wide apart, as in *C. striatus*. Emmrich. Burmeister describes it in the last-named species thus, "A sharp ridge extends itself towards them" (*i.e.*, the eyes), "from the angles of the glabella."† This ridge is well displayed in some of the American Trilobites referred by Professor Hall to *Conocephalites*, for instance, *C. Eos*, *C. diadematus*, etc. Accepting Barrande's definition of the genus as the correct and most satisfactory one, we have a cephalic shield from the Mersey deposit, which appears to correspond generally with it, although not absolutely identical.

### CONOCEPHALITES ? STEPHENSI (sp. nov.),

(Figs. 1—3.)

*Sp. char.*—Cephalic shield, broad, semicircular, with a prominent anterior, and rather flattened margin, glabella elongate, enlarging somewhat towards the front; neck segment, broad, and well marked, without a tubercle. Glabella furrows, four in number on each side, short, and becoming more pit-like towards the front; the basal pair are rather obliquely directed, and are the longest; the most anterior pair are situated in the angle formed by the glabella, front margins, and fixed cheeks; a fifth short, and faint depression exists exactly in the centre of the anterior margin of the glabella. The neck furrow is very deep (in casts), and pit-like at the sides, at the junction of the axal furrows. The latter are deeply excavated, but the marginal furrow in front the glabella is faint. Fixed cheeks broad, of a much less convexity than the glabella, and sub-

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* 16th Annual Report, State Cabinet, N. York, 1863, p. 147.

† *Organisation of Trilobites*, p. 78.

divided into two almost equal parts by a strong double eye-line, or ocular ridge, proceeding diagonally across them from the third glabella pit, on each side. Facial sature cutting the posterior margin far out; posterior margin of the free cheeks broad like the neck segment. Thorax unknown. Free cheeks small, elongately triangular, with a strong broad striate border, and a similar long genal spine; surface granular; eye large, semilunar.

*Obs.* An entire head shield of *C. Stephensi* is not present in the Collection, all that is usually seen being the glabella and fixed cheeks. The position of the eyes is, however, apparent, just at the termination of the ocular ridge, a point where the shield is always broken away.

The abrupt termination of the short glabella grooves, especially the two basal ones, width of the fore cheek, and presence of the ocular ridge, are characters which clearly separate our fossil from *Dikelocephalus;* neither is it a *Lonchocephalus*, from the absence of the backward cervical spine, shape of the glabella, and increased number of furrows on the latter. *C. Stephensi* has many of the characters of *Conocephalites*, as defined by Hall, but I have already pointed out how this definition departs from that of M. Barrande, and other well-known writers. *C. Stephensi* in no way possesses the facial suture of *Bathyurus* or *Bathyurellus*, whilst it has glabella furrows, which would entirely separate it from the former, and partly from the latter. Barrande has remarked on the resemblance of *Conocephalites* to *Cybele* in some of its features. The expanding glabella pit-like furrows at the sides, diagonal eye line, prominent front margin, and large fixed cheeks of *C. Stephensi* appear to bear out this view. The present species is quite distinct from either of the typical European *Conocephalites*, and so far as I can gather, from any of the American forms referred to this genus. At the same time, it must not be forgotten that we are dealing with casts of the interior, from which the crust has been removed; and, therefore, some allowance has to be made in defining the various proportions of the parts described. The axal furrows of the head do not appear to be anything like so deep as in the European species, or even so broad, neither is there any trace of a cervical principle in *C. Stephensi*. It approaches nearest to *C. striatus*, Emmrich[*] in which the eyes are widely separated, and the ocular ridges present, but there is a great difference between the two species in the form of the glabella, and its grooves. Equally distinct are *C. Sulzeri*, Schl.[†] and *C. coronatus*, Barr.[‡] the position of the eyes and form of the glabella in both at once separating them.

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[*] See Barrande, Syst. Sil. Bohême, I. Atlas, pl. 14, Figs. 1—7.

[†] *Ibid*, *pl. 14, F. 8—23.*

[‡] *Ibid*, pl. 13, F. 20—26.

The presence of the eye-line or ocular ridge allies the Tasmanian Trilobite to Hall's *C. minutus*,§ from the Potsdam Sandstone, but they do not otherwise agree. Again, another American species, *C. diadematus*, Hall,‖ possesses an ocular ridge, and other characters noticeable in *C. Stephensi*. I suspect that, whatever may be the ultimate systematic position of *C. Stephensi*, the latter will prove to be congeneric with it.

I have appended to the description of the cephalic shield named in honour of Mr. Stephens, that of a free cheek, constantly associated with the former. In one case only has any appearance of a free cheek in contact with other portions of the head represented itself, and although in a bad state of preservation, it appears to demonstrate the unity of the parts in question.

### Genus DIKELOCEPHALUS. *D. D. Owen.*

### *DIKELOCEPHALUS TASMANICUS* (sp. nov.)

(Fig. 4.)

*Sp. char.*—Pygidium semi-elliptical, moderately convex, and strongly facetted at the anterior angles. Axis tapering gradually, extending almost to the posterior margin, and of six distinguishable segments and a terminal appendage, more than half the width of the pleuræ at its anterior or wider end. Side lobes, or pleuræ, of about eight coalesced and bent down segments, the first broader than any of the others. Limb broad, produced on each side, opposite the fifth segment, into a strong tapering, diverging, and slightly curved spine, extending beyond the posterior limit of the tail for a distance equal to more than half its entire length, exclusive of the spines.

*Obs.* The segmentation, broad border or limb, and single lateral spines, leave no doubt of the relation of this tail to the genus *Dikelocephalus*. The spines, however, are much longer than in the generality of *Dikelocephali*, and in this particular resemble some of the North American Trilobites, referred by Hall to *Conocephalites*. For instance, *C. Jowensis* has a pair of long curved spines, but the other characters do not coincide with the Tasmanian tail. Another species, named by Hall simply *Dikelocephalus* has similar spines, but is otherwise distinct.

The remains of no other Trilobite have been met with in these Caroline Creek beds, at all comparable in size to the present fossil, except the head previously described as *Conocephalites ? Stephensi*. The latter has been shown not to

§ 16th Annual Report, State Cabinet of N. York, 1863, Pl. 8, F. 5.

‖ *Ibid*, Pl. 7, Figs. 36—38.

possess the characters of *Dikelocephalus*, and we cannot, therefore, with the evidence at our command, justly consider these as parts of one and the same Trilobite. Should future researches show them to be so, then we possess a form with a cephalic shield resembling that of *Conocephalites*, more or less, and a tail almost undistinguishable from *Dikelocephalus*. Such a combination of characters would clearly demand the creation of a new genus for their fossils in question.

### Genus ASAPHUS *Brongniart*, 1882.

(Hist. Nat. Const. Foss., P. 17.)

*ASAPHUS.* sp. *a.* (*Fig.* 6.)

*Obs.* A pygidium, measuring sixteen lines by eleven, is preserved in so far that the central axis, one entire wing, and a portion of the other, with the concave margin are present. The latter bears very faint indications of the concentric striæ usually seen around the tail of *Asaphus*. The full width of the tail would probably have been about eighteen lines.

*ASAPHUS.* sp. *b.* (*Fig.* 5.)

*Obs.* A pygidium with a convex surface, and a generally robust appearance. The axis is large, and shows traces of numerous broad segments. It is a squarer and less oval form than in the last species, and the limb is wider and more concave.

It is possible from the general contour and appearance of these specimens that they represent distinct species.

With remains so fragmentary, it is unnecessary to attempt a comparison with known species.

The remaining Trilobites are in too fragmentary a condition to determine satisfactorily. I shall, therefore, merely describe them as far as the material will allow, and indicate the direction in which their affinities probably lie.

1. A head shield with an oblong roundedly-convex glabella, ornamented with granules, rounded in front, and reaching far forward almost to the anterior margin of the head. The furrows are two in number, the anterior pair very faint (in the cast), and almost transverse, the hinder pit-like and rather more oblique; the axal furrows are deep, but gradually become shallower forwards. The fixed cheeks are broad towards the posterior part of the head, and appear to narrow forwards, forming a limited space of demarcation between the anterior part of the glabella and the front margin; the latter is strong and well marked. No definite description can be given of the facial suture, unless what appears to be a defined margin on the right-hand side of the head is it. (Figs. 8 and 9.)

I am unable to satisfactorily refer this Trilobite to any known genus, and I suspect it will constitute a new form, *possessing some of the* characters used in Hall's definition of

*Conocephalites.* The glabella, however, does not decrease in width forwards, and the fixed cheek is too broad; neither can it be placed in *Dikelocephalus.* On the other hand, the Trilobite in question may have some relation with *Loganellus*, Devine*; but here again there is a discrepancy between their respective facial sutures, if the line visible in the Tasmanian form may be so construed.

2. Fig. 10 represents another species (?), apparently congeneric with the last, and to differ simply in the form of the glabella, which is pear-shape and less robust, and proportionately narrower. I take this to be a second species of the genus to which the former Trilobite belongs.

3. The next form to be referred to is represented by Fig. 11. We observe here much the same outline and convexity of the glabella, but apparently only one furrow on each side. It is in a wretched state of preservation, and too much reliance should not be placed on it.

4. The last specimen (Fig. 12) is a fragmentary head shield exhibiting an almost quadrate glabella, without any trace of a furrow. It is short, convex, and almost square, blunt in front, with the axal and neck furrows strong and deep (in casts). Without committing oneself to a definite opinion, the strong resemblance to Billings' genus *Bathyurus* may be pointed out.

A few words may now be said as to the probable age of the Caroline Creek beds, geologically speaking. In the Lower Silurian Rocks of Great Britain, *Conocephalites* ranges from the Lower Lingula Flags to the Menevian Group, but is chiefly characteristic of the former. *Dikelocephalus*, similarly, is confined to the Lingula Flags in Britain. The genus *Asaphus* has a wider range in time, being known as low as the Tremadoc, and as high as the Llandeilo, but it may be said to be representative of the Caradoc and Llandeilo. In Bohemia, according to M. Barrande's tables, † *Conocephalites* is found exclusively in Etagé *C.*, the equivalent of our Lower Lingula Flags, whilst *Asaphus* possesses very much the same range as in Britain. According to Miller's excellent Catalogue of "American Palæozoic Fossils," *Conocephalites* is confined without exception either to the Potsdam or St. John's Groups. The same authority restricts *Dikelocephalus* to the Potsdam and Quebec Groups of the American Geologists. Now, the Potsdam Group, and in part the St. John's, corresponds in age to our Lingula Flags, and to a portion of M. Barrande's Etagé *C.* The Quebec Group is about the equivalent of the British Arenig Series, or Lower Llandeilo. Accepting, therefore, the determination of the foregoing Trilobites as approximating to the truth, it appears more than probable that the age assigned to the fossils from the Caroline Creek

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*See Billings, *Pal. Foss., Canada*, p. 200.

†Syst. Sil. Bohême. 1. Suppl. p. 276.

beds, by Messrs. Etheridge and Lesquereux, is correct, and that this may be looked upon as that of the Lingula Flags or Menevian beds of Great Britain, and the Potsdam Sandstone of North America.

Associated with the Trilobitic remains just described, are those of small discoidal, or planorbicular Univalves. (Pl. 2, Fig. 13 and 14.) The specimens are mere casts, but they present all the appearance of the genus *Ophileta*, Vanuxem, one (Fig. 13) more especially than the other. As a rule, the side of the shell visible in the present specimens is the upper or concave, showing the sunk spire. The whorls are truncate and biangular exteriorly. *Ophileta*, which is chiefly an American genus, occurs commonly in the Quebec Group beds, somewhat higher in the series than the Potsdam Sandstone. On the whole, it strongly corroborates the deduction drawn from the Trilobites, as to the stratigraphical position of the beds in question. There are also the internal casts of a very peculiar bivalve. This I am at present unable to refer to any genus, and must defer an opinion on it to some future occasion. In the meantime it is simply figured. (Pl. 2, Fig. 15.)

### 2. BRACHIOPODA FROM THE CONGLOMERATE OF TABLE CAPE.

(Plate 2.)

Mr. T. Stephens has described the geological features of portions of the North Coast of Tasmania in a very interesting paper, "Remarks on the Geological Structure of Part of the North Coast of Tasmania," etc. According to his observations, there exist along the line of coast, westward from the River Tamar, beds of conglomerate in a series which is possibly of Silurian age.* Between Port Sorell and Table Cape, and above the former, he describes horizontally bedded conglomerates and breccias, unconformably underlying the Tertiary freestone of the Cape, said by Prof. McCoy to be of Miocene age. The conglomerate in question consists of rolled pebbles, and angular fragments of the primary rocks of the neighbourhood, and the Plutonic rocks associated with them. Mr. Stephens adds, "It contains boulders derived from rocks which are not older than the Lower Carboniferous or Devonian period."†

Mr. R. M. Johnston has likewise described ‡ this deposit, forming, as he states, the floor of the Tertiary beds at the locality in question, and containing here and there highly fossiliferous blocks, in one of which Brachiopoda were abundant. Mr. Johnston believes the Table Cape conglomerate to be identical with that of the Dial Range, which is considered by Mr. Gould to be of Silurian age. The remarks of the former, in connection with the Brachiopoda, quite coincide with the specimens forwarded by Mr. Stephens, who gives the locality and horizon as "boulders in a conglomerate of unknown age, near Table Cape, North Tasmania."

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* Papers and Proc. 1869, p. 17.

† *Ibid*, p. 18.

‡ *Further Notes on the* Tertiary Marine Beds at Table Cape. *Papers and Proc. R. S. Tas.* for 1876, p.p. 79—90f.

The limited number of fossils from the blocks forming the conglomerate of Table Cape are presented to us wholly as internal casts, and are very difficult to decipher. The matrix, as exhibited in hand specimens, varies to some extent. Certain of the masses are from a bluish-grey fossiliferous limestone, whilst other specimens, equally organic-bearing, are of a yellow or drab colour when weathered, and appear to be more arenaceous, almost passing at times into a grit.

With few exceptions, the remains are those of Brachiopoda, and, as the most numerous, will claim our attention first. The others are the impressions of a *Tentaculites*, accompanied by fragments of Crinoid stems.

The commonest, and at the same time the most interesting fossil met with in the specimens under description, is undoubtedly a *Pentamerus* (Pl. 2, Figs. 1, 3, 4, 5, 6, 7, and 8), although at first sight its affinities were certainly obscure. There are several specimens in various stages of preservation, some with portions of the shelly matter remaining; but as the best examples are obtained by fracture of the blocks, entire specimens are seldom seen. The present species have externally a more or less triangular outline, like some varieties of *Pentamerus Knightii*, Sby.[*], narrowed towards the beaks and expanded towards the front; but, unlike Sowerby's species, the ventral valve of the Tasmanian shell is very much deflected at the sides and front. The latter becomes almost cuboidal, and, as it were, geniculated, thus producing a perpendicular front to the valves. In this character the shells resemble some Rhynchonellæ, but not otherwise. The surface was covered by radiating ribs, as in *P. Knightii*, but in the casts the umbonal or visceral region is almost smooth, or only bearing traces of the muscular impressions, the ribs commencing to show at a little more than one-third from the beak. This is a very characteristic point, and enables us to identify the species throughout the hand specimens, whether in fragments or partially crushed examples. In Pl. 2, Fig. 3 and 4, are illustrated a characteristic ventral valve, showing the triangular outline and much deflected sides and front. From the beak forwards proceeds the cavity left by the elongated, strong septum, to which would be attached internally the dental plates, and extending for fully one-third the length of the valve. On each side of it, immediately in the umbonal region, is a more or less smooth space, on which *are visible* the delicate impressions of the great muscles. In another specimen, only a fragment (Fig. 6), the septal cavity is again seen, and similar muscular scars. This was the first example which led me to conceive that this shell might be a *Pentamerus*, for its resemblance to one well-known cast of the May Hill Sandstone at once caught the eye.

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[*] *See Davidson's Mon. Sil. Brachiopoda*, T. 17, F. 6 and 7.

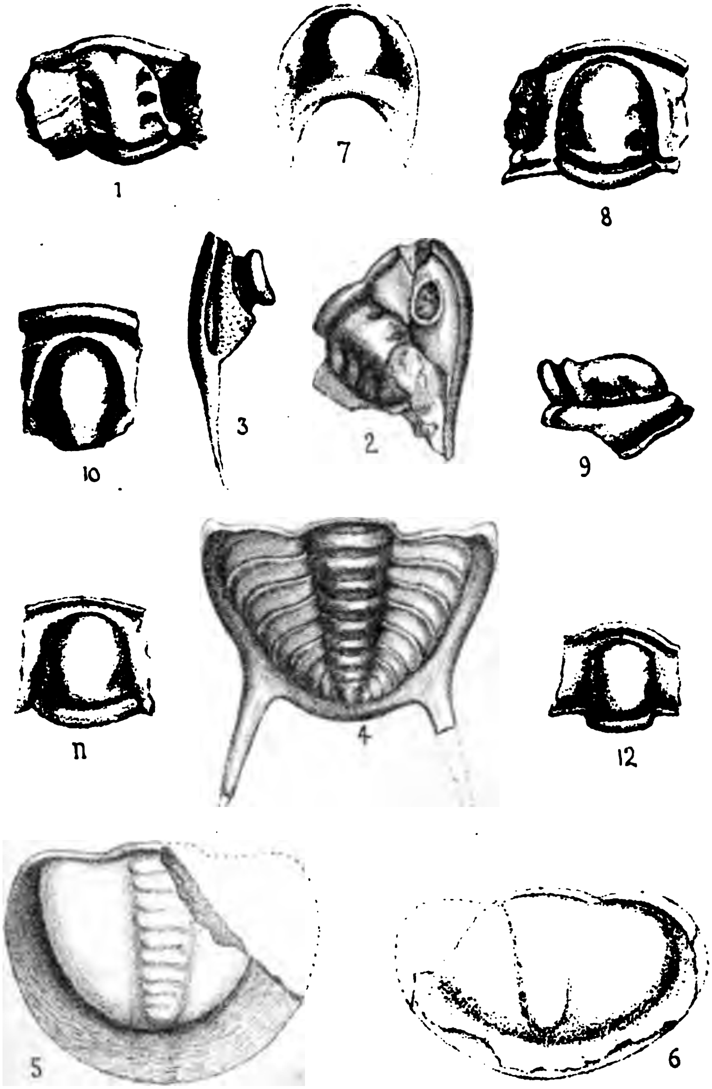
In Pl. 2, Fig. 1, is represented a dorsal valve, in which may be seen the casts of the two septa, enclosing between them a portion of the V-shaped, or fifth chamber, so characteristic of the genus *Pentamerus*. This is again shown on a more striking scale in Fig. 5, in which we meet with the same characters as to general shape, deflected sides, and front of the shell. It is, however, on one side of the larger hand-specimens that the strong confirmation of the *Pentamerus* nature of these shells displays itself. We there observe a number scattered about possessing all the features above described, and also one shell split open with the fifth chamber exposed to view, and its sides of that glistening nature so often met with in British examples. (Pl. 2, Fig. 7 and 8.) I propose to call this shell *Pentamerus Tasmaniensis*.

A fossil, at first sight of a most remarkable nature, may be referred to here. It is an internal cast of two different shells, the *Pentamerus* just described (Pl. 2, Fig. 1), and a *Spirifer* or an *Orthis*, probably the latter, a valve of each placed in apposition as if belonging to one individual. On one side may be seen the dorsal valve of the *Spirifer* or *Orthis* (Pl. 2, Fig. 2), possessing the usual radiating ribs and a smooth medial fold. On the other is what I believe to be a modification of the *Pentamerus* (Pl. 2, Fig. 1), previously referred to. It has a smoother umbonal region, but there is the deflected front sides, the large fifth chamber, and the coarse ribbing.

On another block is a cast of a well-marked *Orthis*, a ventral valve with but few ribs, and those coarse and strong. (Pl. 2, Fig. 16). In all probability it is the opposite valve of the same species we observed accidentally in apposition with the *Pentamerus*. It is not unlike *Orthis biforata*, Schlotheim, a Middle and Upper Silurian form in Europe. Again, it resembles some varieties of *Orthis lynx*, Eichwald, a species met with in the Trenton Group of North America. The Tasmanian shell has about seven ribs on each side the medial fold of the ventral valve.

Another piece of matrix, bearing the number six, has scattered over it numerous small casts of the forms of *Spirifera*. One is very finely striated, with a wide sulcus, and has all the appearance of the Upper Silurian *Sp. plicatella*, Linn., (Pl. 2, Fig. 9 *a* and *c*), or in some points it resembles the young of a Devonian species, *Sp. Verneuilii*. The second species, although small, possesses strong ribs, like Sp. *elevata*, Dalm., or

Pl. I



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TASMANIAN TRILOBITES

perhaps *Sp. Crispa* Hisinger (Pl. 2, Fig. 9 *b*). Lastly, two small pieces of matrix (marked E) have a *Spirifer* similar to the coarsely-ribbed form just mentioned, and what I believe to be several fragmentary casts of a small *Strophomena* (Pl. 2, Fig. 11).

On opening these remarks, I alluded to a *Tentaculites*. It consists simply of impressions of the exterior, apparently representing a simple ridged form (Pl. 2, Fig. 12).

A few words may now be said as to the probable age of the blocks, or at least some of those forming the Table Cape Conglomerate. In British rocks, *Pentamerus* first makes its appearance in the Lower Llandovery, and ascends to the Aymestry Limestone. The genus is again met with in the Middle Devonian. It is, however, particularly characteristic of the Upper Llandovery beds, or May Hill Sandstone. In America it occupies very much the same stratigraphical position, and is particularly characteristic of the Niagara Group. The latter forms the base of the Upper Silurian, just as the May Hill Sandstone does in Britain. The other determinations, being open to criticism, need not have too much stress laid upon them. It may, however, be pointed out that both *Spirifera elevata* and *S. plicatella* are Upper Silurian forms, whilst *Orthis biforata* has a more extended range.

Next to the *Pentamerus* in importance are the impressions of the *Tentaculites*. This genus of Pteropod Mollusca ranges from the Caradoc upwards, but attains its maximum development in the Upper Silurian, although it does extend into the Devonian.

On the whole, it may be said, with a fair amount of probability, that at least some of the Table Cape boulders are of Upper Silurian age, the stratigraphical sub-division of the May Hill Sandstone putting in a very strong claim for recognition.

I have to express my hearty thanks to my friend, Mr. T. Davidson, F.R.S., for his assistance in the provisional determination of the foregoing species of Brachiopoda. Mr. Davidson's assistance is always the more valuable from the hearty manner in which it is rendered.

## DESCRIPTION OF THE FIGURES.

### Plate I.

Fig. 1. Conocephalites Stephensi. *R. Eth., Junr.* The glabella and remains of one fixed cheek; the former shows the four pit-like furrows on each side, and the central indentation in the front; across the latter is visible the ocular ridge, or eye-line.

Fig. 2. Another example of the same, with lying on it a free cheek and remains of the eye.

Fig. 3. Another free cheek, probably belonging to this

species, showing a portion of the eye, the long genal spine, and the granular surface

Fig. 4. Dikelocephalus Tasmanicus. *R. Eth., Junr.* A tail exhibiting in an exceedingly fine manner the characters of the species, including the long tail spines.

Fig. 5. Asaphus, sp. *b.* Larger portion of a pygidium or tail, with a wide limb, or border, delicately striated.

Fig. 6. Asaphus, sp. *a.* A similar, but smaller and much more oval tail.

Fig. 7. Labrum.

Fig. 8. Glabella and portion of the fixed cheeks of a Trilobite, which would perhaps fall within Hall's definition of *Conocephalites.*

Fig. 9. Side view of the same.

Fig. 10. Another form nearly allied to Fig. 8, but having a more pear-shaped glabella, and wider frontal margin.

Fig. 11. Another glabella, of a squarer form than in either of the preceding, and with only one pit-like furrow on each side.

Fig. 12. Fragmentary head-shield, with an almost quadrate glabella, and no visible furrows.

Plate II.

Fig. 1. Pentamerus Tasmaniensis, *R. Etheridge, Junr.* Internal cast of the dorsal valve, showing the cavities of the two septa, enclosing between them a portion of the V-shaped or fifth chamber.

Fig. 2. Spirifer sp., dorsal valve, perhaps, of Fig. 16.

Fig. 3. Pentamerus Tasmaniensis, an internal cast of the ventral valve, exhibiting the cavity left by the large septum.

Fig. 4. Side view of the same specimen, with the deflected sides and front of the shell.

Fig. 5. Another dorsal valve of the same species.

Fig. 6. Portion of another ventral valve, showing the septal character and muscular scars.

Fig. 7. Portion of a slab, with portions of three individuals, and part of another, in which the fifth or V-shaped chamber is exposed by fracture.

Fig. 8. The fractured portion removed from No. 7.

Fig. 9. Portion of a slab with *(a & c) Spirifer*, resembling *S. plicatella*, Linn. (*b*), another *Spirifer*, not unlike *S. crispa*, His. or *S. elevata.* Dalman. x 2.

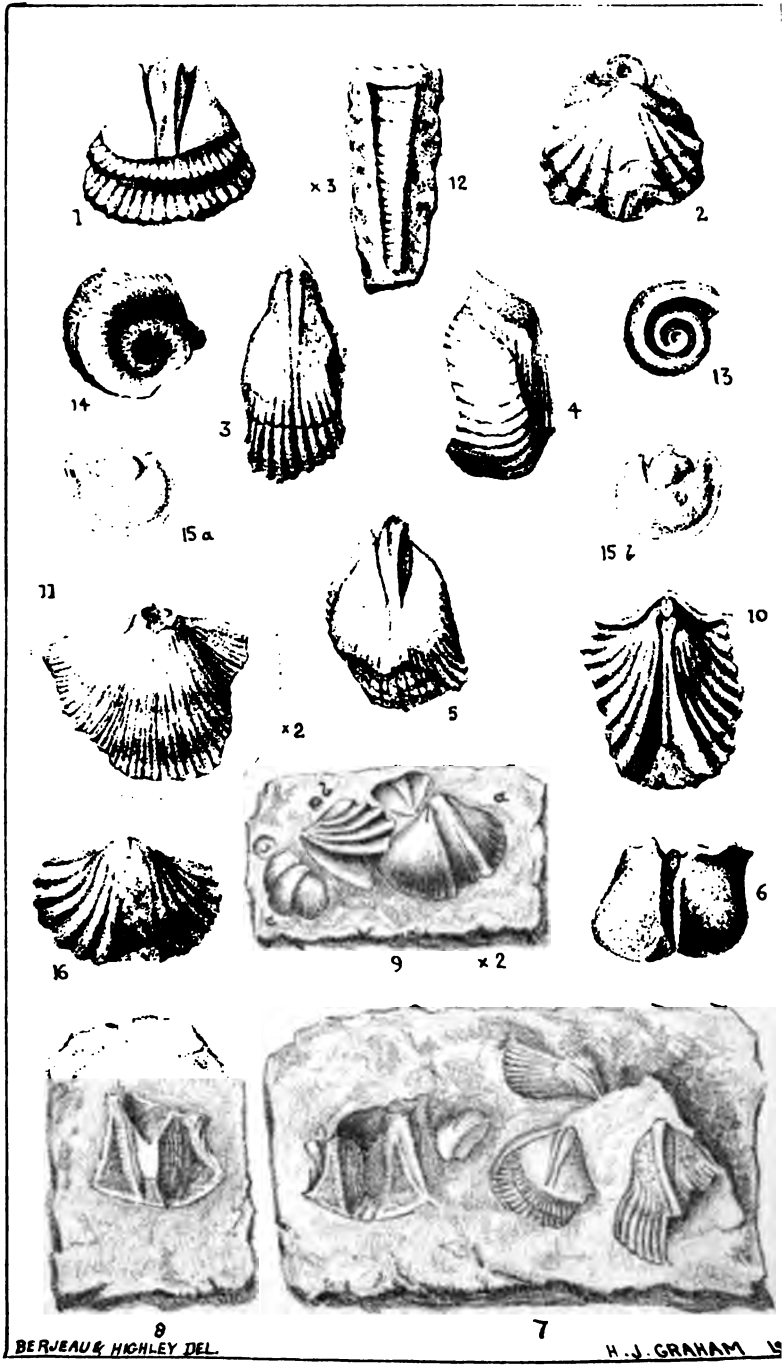
Fig. 10. Portion of another form of *Spirifer* (?) or perhaps an *Atrypa.*

Fig. 11. Fragment of a shell, with the appearance of a *Strophomena.* x 2.

Fig. 12. Cast of a small *Tentaculites.* x 3.

*Fig. 13. Small* Univalve, in all probability an *Ophileta,* from a *wax cast.*

Pl II



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TASMANIAN SILURIAN MOLLUSCA

Fig. 14. Another Univalve, a different species to the last.
Fig. 15. Internal casts of a Bivalve (?) undetermined.
Fig. 16. Orthis sp., resembling *Orthis biforata*. Schlotheim.

N.B.—The originals of Figs. 13, 14, and 15 are from the Caroline Creek beds; the remainder are from the Table Cape conglomerate.

## ECONOMIC VALUE OF THE AQUATIC PLANT *TYPHA LATIFOLIA.*

By James Barnard.

[*Read* 17*th July*, 1882.]

Actuated by a philanthropic spirit, Signor C. A. de Goyzueta, Italian Consul at Melbourne, recently addressed a communication to the Government of Tasmania in reference to this aquatic plant, and dwelling upon certain valuable properties which it possesses. The following is an extract from that communication:—

"The commander of the royal transport *Europa* when in this port (Melbourne) offered the Victorian Humane Society of Melbourne a sample of the buoyant mattresses used on board the Italian vessels for their efficiency as a life-saving apparatus in maritime disasters.

"The same society tested that mattress, and found that it can easily support two persons on the water; so that, deeply convinced of their utility, they came to the decision to promote the introduction into the colony of the plant those mattresses are stuffed with.

"By direction of His Excellency the Minister of Marine, I communicated to the said society, in answer to a relative question, that this plant, known in botany by the name of Typha latifolia, is an aquatic one, spontaneously growing in marshes and other stagnant waters in the southern as well as in the northern provinces of Italy; wherefore there is ground to believe that it might be introduced under every climate. It is very far lighter than water, hygienic, and lasts not less than any other vegetable used in stuffing mattresses.

"I thought it my duty, for humanitary interests, to bring the above under notice, in the opinion that many lives would be spared were the Typha latifolia generally employed in preference to other vegetable or animal substances for the mattresses used at sea."

Duly estimating the importance of bringing under public notice a plant of this useful character, the hon. Colonial

Secretary forwarded to the Royal Society Signor Goyzueta's letter, with an inquiry, "Whether the plant referred to existed in the Society's Gardens, and whether it was considered desirable to attempt its cultivation for economic purposes?" This being referred to the Superintendent of the Gardens, Mr. Abbott reports that Typha latifolia is not to be found in the Society's Gardens, nor, he believes, in any of the colonies; but "that T. angustifolia is abundant in most of the Tasmanian marshes, and it is probable that it might be utilised for the same purposes as the other species." On the second point, Mr. Abbott has great doubt whether the introduction and cultivation of this plant would be profitable; and suggests that "attention should be first directed to the species to be found naturally in the island, especially as even this is by some botanists held to be merely a variety."

While yielding assent to the sensible proposition that we should not overlook the species to be found indigenous in Tasmania, and testing its utility, still we should not forego the opportunity which seems to be presented to us of procuring for acclimatisation the distinctive plant to which is assigned the special qualities set forth. Whether the introduction and cultivation of the right plant should be profitable or not, there are much higher than pecuniary considerations involved in its favour.

The many lamentable disasters at sea and deplorable shipwrecks, which from time to time cause a thrill of horror like an electric shock to pervade the community, demand the adoption of every possible precaution against such dire calamities; and, simple as this remedy appears, it may yet be the means of snatching many a valuable human life from otherwise inevitable destruction.

Loudon, in his *Encyclopædia of Gardening*, describes three species of Typha, upon the authority of Willdenow, viz., T. latifolia, T. minor, and T. angustifolia, or Greater, Dwarf, or Lesser Cat's Tail; the generic name is taken from τυφος, a marsh, in which all the species naturally grow. T. latifolia he describes as one of the handsomest aquatics of the reed kind; its leaves are of a bluish colour, an inch in width, and 3ft. long. The pollen of the flower is very abundant, and a light being applied to it, a flash of fire is produced. Haller says that the roots are eaten in salad, that cattle eat the leaves, and that the downy seeds serve for stuffing pillows. The leaves are sometimes used by coopers, and introduced between the staves of their casks; and they are frequently used for making mats, baskets, chair-bottoms, and sometimes for thatch. Rubens, and other Italian painters after him, have *put it* into the hands of our Saviour as a sceptre when He was *saluted as a king* in mockery by Herod's soldiers. The plant, Mr. Loudon adds, appears to be a native of every part of the world, in ponds, ditches, and by the sides of rivers and brooks. In the *Penny Cyclopædia* the three species of "Typha" are fully described, and "T. angustifolia" is figured. In reference to "T. latifolia" (and to this species only), the writer states that on the Continent the down of the flowers is used for stuffing pillows, etc.

In *Chambers' Encyclopædia*, it is stated that there are two species of "Typha" found in Britain. "T. latifolia" and "T. angustifolia," and are popularly known as Cat's Tail or Reed Mace. The former species is the most common, and is sometimes called Bulrush. It grows to the height of 5 or 6ft. The root stocks are astringent and diuretic, and abound in starch. The young shoots of both species are much eaten by the Cossacks of the Don, and are sometimes used in England under the name of Cossack asparagus. "T. angustifolia" and "T. elephantina" are used in India for making mats and baskets.

Sir Joseph Hooker, in his "Flora of Tasmania," speaking of the order "Typhaceæ," etc., refers the genus "Typha" to Australia, New Zealand, and Scinde in Western India. He remarks that, "the species are not well characterised; the Tasmanian one (meaning the 'T. angustifolia') seems to be the same as the English, though larger than the common European state of the same plant," and "is common in marshes, banks of rivers," etc.

With the knowledge of the properties of this plant, hope is entertained that it may lead to the creation of a new industry, in the manufacture of sea-going mattresses. A pattern mattress could, no doubt, be readily obtained from Melbourne, with all particulars of price and profit. An experiment could then be made to test the question whether a mattress stuffed with the down of an indigenous Typha, of whatever species it may be, would fulfil the conditions claimed for the life-preserving one. If successful, there can be little doubt that but few vessels would be unprovided with them; and thus a possible means of escape from a watery grave would be afforded in many cases of shipwreck on a coast and within a moderate distance of land.

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In the previous part of the paper I had the honour to bring before the Royal Society the subject of the economic value of the aquatic plant, Typha latifolia; and I am now enabled, through the courtesy of the honourable Colonial Secretary, to add to these notes the result of the further correspondence which has taken place between the Italian Consul and the Government.

With his communication giving further particulars, Signor

De Goyzueta transmitted a packet of the seed of the plant, and also a sample of the buoyant mattress. The former was at once sent to the Superintendent of the Royal Society's Gardens, as recommended, with the view of trying "whether the climate and soil are favourable to the propagation of the plant;" and it is believed, however, that we possess in the seed of the Tasmanian Typha, whatever be its specific distinction, an equivalent material, and distributed in abundance throughout the marshes and river banks of the island, that will equally fulfil the same purpose. Samples of each sort have been submitted to the Government Analyst, Mr. W. F. Ward, with a view of testing their respective qualities and properties, and that gentleman has pronounced their physical characters to be almost identical, there being only a minute difference in their specific gravity, the Tasmanian seed being very slightly heavier, probably to be accounted for by the Italian species having been submitted to a cleansing process previous to manufacture into mattresses whereby all the denser particles have been eliminated.

In reference to its preparation for manufacture, the Signor states "that the elasticity and flexibility of the T. latifolia is obtained by cutting off its ears, and by submitting it to the action of ventilators, in order to clean it from every heterogeneous matter." He adds also that "the Italian Government pays for such mattresses, to be delivered in Spezia by the contractor of the Royal Marine, 12·95f., or 10s. 4½d. each."

In presenting the sample mattress to the Museum of the Royal Society, with a view to its becoming open to public inspection, the hon. Mr. Moore makes the following valuable suggestion:—

"It has occurred to me that the mattress might be made more practically available in saving life if it was constructed in two portions, but joined at the upper surface, and furnished with straps and buckles at each end. It could thus be instantly made into a life-buoy."

In the records of shipwrecks, how many cases of drowning have occurred within sight of land, and where a resource of the kind proposed would have averted sorrow from many a bereaved family. Instances of this sort must occur to every one without being specified. Sailors, as a rule, are proverbially reckless of danger, and disregard even ordinary precautions for their own safety; yet, when brought face to face with actual peril, and all hopes of escape seem vain, many are at once deprived of their presence of mind and yield to despair. In such cases this would be counteracted by the knowledge that at least one possible means of extrication from drowning *was open to their grasp.*

It is hoped that the attention of manufacturers will be attracted to the advantage of introducing this life-saving mattress into the marine service; and that the importance of its use on board ship will be generally recognised, and lead to the establishment of the industry. Our river craft and sailing boats more especially should be provided with it; and in these the mattresses could be utilised as cushions, and so be immediately available when necessity required in case of disaster.

## DESCRIPTION OF SOME NEW MARINE SHELLS OF TASMANIA.

By Lieut. C. E. Beddome, I. N.

[*Read 9th October*, 1882.]

No. 1.—Drillia Woodsi.

Shell elongately fusiform, turretted; spire longer than aperture, shining orange colour; sutures with a white line, below which is a band of white nodules; on the body whorl a row of white spots below the nodules; whorls 7; apex mamillated; aperture ovate; sinus deep; labrum thin. Long., 13 mill.; lat., 5 mill.; apert., 5 mill. Habt., Long Bay, D'Entrecasteaux Channel, 10 fms. I dedicate this species to the Rev. Tenison Woods, who has done so much for the conchology of this Island.

No. 2.—Mangelia Cancellata.

Shell small, narrowly fusiform, turretted; fulvous brown; whorls 5, sloping angulate above plicate lengthwise; interstices broadly striate, giving the whole shell a cancellated appearance; aperture narrowly oval, lip simple. Long., 4·5 mill.; lat., 1·5 mill.; apert., 2 mill. Habt., Kelso Bay, Tamar River, 17 fms.

No. 3.—Marginella Petterdi.

Shell bulbiform, shining white; spire immersed; outer lip moderately thickened; columella with four plaits. Long., 9 mill.; lat., 4 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this species to Mr. W. F. Petterd, who is a naturalist that has devoted most of his time to the fauna of the Australias, and has done more for the conchology of Tasmania than any one.

No. 4.—Drillia Legrandi.

Shell turretted, broad; ribs rounded, raised; interstices *striate, with fine lines, which* pass over the ribs; whorls 5, swollen; aperture oval; sinus deep; outer lip varicose. Long., 7 mill.; lat., 3·5 mill.; apert., 3 mill. Habt., off Tinder Box, D'Entrecasteaux Channel, 7 fms. I dedicate this species to Mr. W. Legrand, the veteran of Tasmanian collectors.

No. 5.—Rissoa (Alvania) Bayntoni.

Shell minute, turbinate, cancellate, brown; outer lip pallid; mouth oval, two-thirds length of spire; whorls 5; sutures deep. Long., 3 mill., lat., 2·5 mill. Habt., N. W. Bay, D'Entrecasteaux Channel. I dedicate this species to Mr. W. Baynton, who takes a lively interest in the fauna of this Island.

No. 6.—Eulima Legrandi.

Shell elongate, smooth, shining, hyaline; whorls 8, flat, highly polished; aperture pyriform; apex obtuse. Long., 3 mill.; lat., 1·5 mill.; apert., 1 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this species to our veteran collector.

No. 7.—Eulima Petterdi.

Shell shining white, curved; apex rounded; whorls 10; aperture narrowly pyriform; lip scarcely reflected; columella straight. Long., 4 mill.; lat., 1 mill.; apert., 1 mill. Unlike any of our Eulimidæ. Habt., Blackman's Bay, Derwent River.

No. 8.—Modiolarea Tasmanica.

Shell trapezoidal, thin, fragile, ventricose; brown under lens; numerous lines of growth; hind margin rounded; hinge; two small oblique teeth. Long., 3 mill.; lat., 4 mill.; alt., 2·5 mill. Habt., Cloudy Bay, South Bruny Island, and off Brown's River.

No. 9.—Cyclostrema Bruniensis.

Shell small, discoid, shining brown; whorls 4, inflated; sutures deep; aperture rounded entire; umbilicus deep. Long., greatest 1·75 mill., least 1·5 mill.; lat., 1 mill. Habt., Cloudy Bay Lagoon, South Bruny Island.

No. 10.—Cyclostrema Johnstoni.

Shell minute, discoid, rounded above; whorls 4; regularly and distantly ribbed; aperture entire obicular; umbilicus open. Long., greatest 1 mill., least 0·75 mill.; lat., 0·25 mill. Habt., off Old Station, Brown's River Road, 7 fms. I dedicate this species to my friend and fellow-worker, Mr. R. M. Johnston, who is well known to all naturalists in the Australias.

No. 11.—Cemori Harrissoni.

Shell ovate, conical; surface with radiating ribs; apex *sub-spiral, recurved posteriorly*; perforation narrow, oval;

interior with shelly plate half covering the perforation. Long., 4 mill.; lat., 2·75 mill.; alt., 5 mill. Habt., off Old Station, Brown's River Road, 7 fms., and Bruny Island. I dedicate this species to Mr. Charles Harrisson, one of my fellow-workers.

No. 12.—AKERA TASMANICA.

Shell minute, thin, ovate, cylindrical, ventricose; whorls distinct; channelled at sutures; brown, with two white bands on body; whorl aperture elongate, pyriform, rounded in front; columella excavated. Long., 2 mill.; lat., 1 mill. Habt., off Old Station, Brown's River Road, 7 fms., and Bruny Island.

No. 13.—FISSURELLA CRUCIS.

Shell oval, raised and cancellated; white or yellowish; two red lines on back forming a cross; aperture oval. Long., 9 mill.; lat., 5 mill.; alt., 2 mill. Habt., Kelso Bay, Tamar River, 17 fms.

No. 14.—New Genus, LEGRANDIA.

Shell emarginulaform, but with an internal plate like Crypta.

LEGRANDIA TASMANICA.

Shell oval, radiately ribbed; front edge fissured; interior with a shelly plate extending one-fourth the length of the shell. Long., 5 mill.; lat., 3 mill.; alt., ·75 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this genus to our veteran collector, Mr. W. Legrand.

No. 15.—ALEXIA HARRISSONI.

Shell oblong, ovate, imperforate, smooth, covered with a greenish-brown coloured epidermis; spire acuminate; whorls 6; aperture narrowly ovate; inner lip three plaits; outer lip one plait, and slightly reflected; aperture as long as spire. Long., 10 mill.; alt., 4 mill.; apert., 4 mill. Habt., boulder beaches near mouth of freshwater creeks on banks of Derwent River. This species was first found by Mr. Charles Harrisson; I have much pleasure in dedicating it to him.

No. 16.—RISSOA (LETIA) FLAMIA.

Shell minute, turbinately conoid, subumbilicate, white, with red diagonal flames; whorls 5, rounded, smooth; sutures deep; aperture rounded; outer lip acute. Long., 2 mill.; lat., 1 mill. Habt., Blackman's Bay, 7 fms.

I dredged a specimen of Crosse Concinna Angus in 17 fms., off Kelso, Tamar River. Until now, I believe this species has only been found at Port Jackson, N.S.W., where it is very rare. It is interesting to be able to add this rare species to the fauna of our Island.

In the Society's Proceedings of 10th May, 1881, I described a shell as *Delphinula Johnstoni*. I now find that the Rev. J. E. Tenison Woods described the same shell as Crossed Cancellata. I was led into this error by the Rev. Tenison Woods, who described a fossil shell of the Tertiary period, of the same form, as *Delphinula tetragonostoma*.

# NOTE ON CLINUS DESPICILLATUS, *RICHARDSON*, AND BOVICHTHYS VARIEGATUS, *IBID.*

### By Robt. M. Johnston, F.L.S.

[*Read 9th October*, 1882.]

I recently obtained two specimens of the genus Clinus, which was known to be viviparous long before the time of the great French naturalist, Cuvier. It is stated by Dr. Gunther that Bloch verified this fact in the diagnosis of *Clinus superciliosus*. One of the two species which I have referred to was examined by me, and was found to be full of young fish, most of them having just burst the egg. Under the microscope the pulsations of the heart were distinctly visible, and all the parts seemed to be well developed, although from the specimen exhibited it will be seen that each individual is extremely minute. The eyes, relative to the size of the body, seem very large. They were of a beautiful bright blue colour when alive, and were perfectly formed. The following are the chief characteristics of the parent fish:—

B. 5. D. $3\,\frac{33}{5}$. A. $\frac{2}{24\text{-}25}$. V. $\frac{1}{3}$.

Total length, 16 inches; greatest depth, 5 inches. Although the three specimens examined by me had 5 soft rays in posterior dorsal fin, I have no hesitation in classing them as *Clinus despicillatus*, Richards.

I also obtained a specimen of *Bovichthys variegatus*, Richardson, $5\frac{1}{4}$ inches long, which is extremely rare:—

D. 8/19. A. 17. P. 15.

Body ornamented with 8 crossbars.

# DESCRIPTIONS OF HITHERTO UNDESCRIBED ANTECHINI AND MURIDÆ INHABITING TASMANIA.

By Edmund Thomas Higgins, M.R.C.S. Eng., and William Frederick Petterd, C.M.Z.S.

[*Read 9th October*, 1882.]

When the late Mr. Ronald Gunn's paper on the Mammalia of this Island was published, some 30 years since, in the Transactions of the Royal Society of Tasmania, only three species of Antechinus, and three of Mus, were recorded as having been found in Tasmania.

The descriptions of the Muridæ are excessively short, but sufficient for the recognition of the species. Since then nothing has been done on the subject, until Mr. Thomas' paper describing two new Muridæ. One belonging to a new genus, Mastacomys, appeared in the June number for this year of the *Annals and Magazine of Natural History.* Knowing from observation that other species inhabiting this Island were still undescribed, we have for some time past been engaged in procuring all the small mammals we could; and have the honour of laying before the Royal Society our first paper containing descriptions of three new Antechini and four Muridæ, and hope shortly to supplement it. From the dense damp nature of the scrubs, and the peculiar hilly conformation of the country, almost every district is likely to produce distinct species. Being anxious to make our work as complete as possible, we are desirous of obtaining specimens from every part of the Island, and shall therefore take it as a special favour if the members of the Society will use their utmost endeavours to supply us with materials for this purpose.

### ANTECHINUS ROLANDENSIS, ♂.

Ears very short, clothed with adpressed dark hairs; fur long and soft, reddish at the tips, bluish-grey at the base; paler on the posterior third of the body, with scattered black hairs; under surface dark ashy-grey; head clothed with short stiff hairs of a greyish-brown colour, slightly tinted with fulvous brown; two darker stripes extend from nose to eye; fore and hind feet clothed with short adpressed hairs of a yellow tint; under sides of feet thickly tuberculated, the tubercles transversely striated; whiskers long and black; tail short, covered with short dark-brown hair above, paler on the under side.

| | | |
|---|---|---|
| Length from *tip of nose to* root of tail ... | 7½ | inches. |
| „ *of tail* ................................ | 2⅜ | „ |
| „ *from nose to ear* ...................... | 1½ | „ |

| | | |
|---|---|---|
| Length of ear | $\frac{5}{8}$ | inches. |
| „ of fore feet and claws | $\frac{5}{8}$ | „ |
| „ of hind feet and claws | $1\frac{1}{8}$ | „ |
| „ of skull | $1\frac{3}{8}$ | „ |
| Width of skull | $\frac{3}{4}$ | „ |
| Length of nasal bones | $1\frac{1}{16}$ | „ |
| „ of lower jaw | $1\frac{1}{8}$ | „ |
| Circumference of chest | $3\frac{1}{2}$ | „ |

In size approaches A. Swainsonii, but differs from it in the colour of its fur, in the colour of its feet, shorter tail, and greater width and convexity of the zygomatic arches. Found in the neighbourhood of Mount Roland, by Mr. E. Higgins, of Kentishbury.

ANTECHINUS LEUCOGENYS, ♂.

Ears moderately long, sparsely covered internally, and thickly externally with dark-brown hair; whiskers dark-brown and white, and of a moderate length; fur very long, rufous brown, interspersed with darker hairs. Hair on the head bluish-grey at the base, yellow in the middle, and dark-brown at the tips, producing a variegated appearance; lips margined with white; *chin white;* the hairs on the under surface pale yellowish-brown, the tips white; fore feet and portion of leg white; hind feet white; tail brown, with scattered dark hairs; hind feet with numerous transversely striated tubercles; form exceedingly slender.

| | | |
|---|---|---|
| Length from tip of nose to root of tail | $3\frac{1}{2}$ | inches. |
| „ of tail | $3\frac{1}{4}$ | „ |
| „ from nose to ear | 1 | „ |
| „ „ to eye | $\frac{5}{8}$ | „ |
| „ of ear | $\frac{1}{2}$ | „ |
| Width „ | $\frac{3}{8}$ | „ |
| Length of fore feet and claws | $\frac{3}{8}$ | „ |
| „ of hind feet and claws | $\frac{5}{8}$ | „ |
| „ of skull | $1\frac{1}{16}$ | „ |
| Width „ | $\frac{9}{16}$ | „ |
| Length of nasal bones | $\frac{7}{16}$ | „ |
| „ of lower jaw | $\frac{3}{4}$ | „ |

In its measurements this species approaches to Albipes and Murina, but differs from both by its exceedingly slender form, the colour of its fur, and by the *white chin*, which is so especially characteristic in this species, which was obtained by Mr. A. Simson, of Launceston, at Ringarooma, and kindly placed at our disposal. The soles of hind feet thickly covered with small tubercles. This species therefore belongs to Gould's subgenus Podabrus.

*ANTECHINUS NIGER,* ♀.

*Form very robust;* ears large and wide, internally and *externally thickly* covered with short, dark-brown hairs, and having an indentation at about one-third from the lower margin; fur dense, and moderately long; on the upper surface of a very dark-brown colour, and *thickly* interspersed with long black hairs; under surface of a brownish-grey; upper surface of tail rather thickly covered with short, dark-brown, almost black hair, rather paler on the under surface; fore and hind feet covered with short, close set, brown hair, almost black; palms and soles of feet very dark; fore feet have five prominent striated tubercles, and are furnished with remarkably long claws; hind feet have six prominent transversely striated tubercles; whiskers of moderate length, and almost black.

| | | |
|---|---|---|
| Length from tip of nose to root of tail...... | 5¼ | inches. |
| „ of tail.......................................... | 3⅛ | „ |
| „ from nose to ear........................... | 1⅜ | „ |
| „ „ to eye........................... | ¾ | „ |
| „ of ear............................................ | 11/16 | „ |
| Width „ ........................................... | 11/16 | „ |
| Length of fore foot and claws........................ | 1 1/16 | „ |
| „ middle claw........................... | 11/16 | „ |
| „ hind foot and claws.................. | ⅞ | „ |
| Circumference of chest........................... | 4⅛ | „ |
| Length of skull......................................... | 1¼ | „ |
| Width „ ........................................... | 11/16 | „ |
| Length of nasal bones............................ | ½ | „ |
| Length of lower jaw................................ | (Not given). | |

This most interesting species differs from all its described congeners in Tasmania and Australia by its extremely robust form, the powerful build of its feet, by the extremely long claws of the fore feet, and the dark, almost black appearance of its fur. To Mr. Sultzberger, of the Upper Piper, we are greatly indebted for this beautiful Antechinus.

**Mus griseocæruleus**, ♂ and ♀.

Ears naked, and moderately long; whiskers 2½ inches long, black; fur long, bluish-grey, passing at the sides into pale, ashy-grey, which colour extends over the entire under surface; feet clothed with short, yellow hairs; tail sparsely covered with short stiff hair of a black colour; scales freely showing through.

| | | |
|---|---|---|
| Length from tip of nose to root of tail...... | 7½ | inches. |
| „ of tail.......................................... | 6¾ | „ |
| „ from nose to ear........................... | 1½ | „ |
| „ „ to eye........................... | ¾ | „ |
| „ of ear............................................ | ½ | „ |
| „ of fore foot and claws.................. | ⅞ | „ |
| „ of hind foot „ .................. | 1⅜ | „ |
| „ of skull.......................................... | 1⅝ | „ |
| Width „ ........................................... | ⅞ | „ |
| *Length of nasal bones*............................ | ⅝ | „ |
| „ *lower jaw*.................................... | 1⅛ | „ |

*"Blue Rat" of the colonists*; widely distributed over the

northern portion of the Island; has been obtained at Kentishbury, Deloraine, and Launceston. In half grown specimens the under surface is sometimes quite white; supraorbital ridge extends to occipital crest; coronoid process thin, narrower, less curved, and more acuminate than in Mus decumanus; condyloid process longer, and thin; posterior angle rounded and broad; descending ramus deeply emarginated.

*Fig.* 2.—Lower jaw of natural size.

2*a*.—Superior molars magnified.

**Mus leucopus**, ♀.

Ears long and patulous, internally sparsely, and externally thickly covered with short, dark, almost black hair; whiskers rather full, black and white hairs, 2¼ inches in length; nose grey, extreme tip nearly white; fur long, soft, dark-brown, tipped with pale fulvous brown, slightly paler at the sides, passing into dirty ashy-grey underneath; tail long, upper surface clothed with short dark hair, interspersed with paler hair; under surface covered with *white* hair, concealing the scales; fore and hind feet white.

| | | |
|---|---|---|
| Length from tip of nose to root of tail | 5¾ | inches. |
| „ of tail | 3¾ | „ |
| „ from nose to ear | 1⅛ | „ |
| „ „ to eye | ⅝ | „ |
| „ of ear | ¾ | „ |
| Width „ | ½ | „ |
| Length of fore foot and claws | ¾ | „ |
| „ hind foot and claws | 1½ | „ |
| „ of skull | 1⅜ | „ |
| Width „ | ¾ | „ |
| Length of nasal bones | ½ | „ |
| „ of lower jaw | 15/16 | „ |
| Circumference of chest | (Not given). | |

Principally noticeable by the pure whiteness of entire under surface of tail; supraorbital ridge absent; coronoid process short and pointed; condyloid process pointing backwards; posterior angle short, and slightly acuminate; descending ramus moderately emarginate. Obtained by Mr. E. Higgins, of Kentishbury, near the Minnaw River.

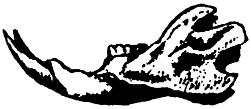
*Fig.* 4.—Lower jaw, natural size.

4*a*.—Superior molars magnified.

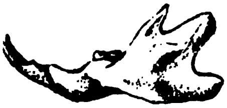
**Mus variabilis**, ♂.

Ears rather large, broad, very rounded at the apices, and almost naked; whiskers dark-brown, almost black, with intermingled white hairs 2½ inches long; fur dark bluish-grey on the back, gradually becoming paler towards the *under surface;* feet brownish; tail thickly covered with *short, dark-brown hairs,* through which the scales are visible.

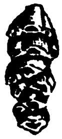
♀.—*Fur rather long* and soft, on the back of a fawn



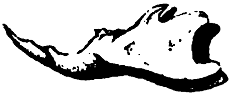
1



2



2 a



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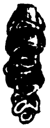

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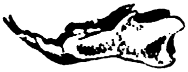
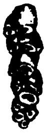
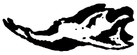


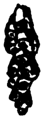
4



4 a



5



5 a

gins. Delt.

H.J. Graham. Lith.

MU

## LIST OF FIGURES, TASMANIAN *MURIDÆ.*

*Fig.* 1.—Lower jaw of ***Mus decumanus.***
„ 2.—Ditto of ***Mus griseocæruleus.***
„ 2*a*.—Superior molars of ditto, magnified.
„ 3.—Lower jaw of ***Mus variabilis***, natural size.
„ 3*a*.—Superior molars of ditto, magnified.
„ 4.—Lower jaw of ***Mus leucopus***, natural size.
„ 4*a*.—Superior molars of ditto, magnified.
„ 5.—Lower jaw of ***Mus Simsoni***, natural size.
„ 5*a*.—Superior molars of ditto, magnified.

colour; the base of the hairs bluish-grey, with numerous black hairs scattered throughout; the fur gradually pales to white on the entire under surface, where the hairs are perfectly white to their base; fore feet very pale fawn colour; hind feet white. In all other respects the female resembles the male.

| | | |
|---|---|---|
| Length from tip of nose to root of tail | 8 | inches. |
| „ of tail | 8 | „ |
| „ from nose to ear | $1\frac{7}{8}$ | „ |
| „ „ to eye | 1 | „ |
| „ of ear | $\frac{3}{4}$ | „ |
| Width „ | [illegible] | „ |
| Length of fore foot and claws | [illegible] | „ |
| „ hind foot and claws | 1 [illegible] | „ |
| „ skull | 1 [illegible] | „ |
| Width of „ | $\frac{7}{8}$ | „ |
| Length of nasal bones | $\frac{9}{16}$ | „ |
| „ lower jaw | $1\frac{1}{8}$ | „ |

Supraorbital ridge very prominent, extending as far back as the occipital crest; palatine openings long and narrow; coronoid process rather short and acuminate; condyloid process inclined backwards; posterior angle rounded, narrow, and long; descending ramus deeply emarginate.

*Fig.* 3.—Lower jaw, natural size.
3*a*.—Superior molars magnified.

From Mr. Swan, of St. Leonards, to whom we are indebted for the specimens, we learn that these rats are of many colours. For this reason we have selected the specific name.

**Mus Simsoni, ♀.**

Ear moderately long, clothed internally and externally with short brown hairs, which are rather darker on the outer surface; whiskers moderately long, dark-brown; fur greyish-brown, interspersed with darker hairs; under surface of a paler tint; face bluish-grey; chin white; fore and hind feet clothed with short yellowish-white hairs; tail moderately clothed with pale-brown hair; scales distinctly visible; base of tail thickened.

| | | |
|---|---|---|
| Length from tip of nose to root of tail | $2\frac{5}{8}$ | inches. |
| „ of tail | $2\frac{7}{8}$ | „ |
| „ from nose to ear | [illegible] | „ |
| „ „ to eye | [illegible] | „ |
| „ of ear | [illegible] | „ |
| Width „ | $\frac{3}{16}$ | „ |
| Length of fore foot and claws | [illegible] | „ |
| „ hind foot and claws | [illegible] | „ |
| „ of skull | [illegible] | „ |
| Width „ | [illegible] | „ |
| Length of nasal bones | [illegible] | „ |
| „ *lower jaw* | [illegible] | „ |

*No supraorbital ridge;* condyloid process very convex anteriorly; a deep sulcus between it and the coronoid process, which is rather short; posterior angle very short, and slightly acuminate; descending ramus deeply emarginate.

To Mr. A. Simson we are indebted for this species, which was found by him in some abundance at Ringarooma, and have pleasure in naming it after him, as a slight acknowledgment of his kindness in having so liberally given it, as well as the Antechinus leucogenys, to us.

*Fig.* 5.—Lower jaw, natural size.
5*a*.—Superior molars magnified.

Species of Antechini now known to inhabit Tasmania :—
Antechinus Swainsonii, Waterhouse, Ann. and Mag. Nat. Hist. 1840, p. 300.
„ minima, Temminck, Mon. de Mam, Vol. 1, p. 50.
„ leucopus Gray, Ann. and Mag. Nat. Hist., 1842, p. 261.
„ Rolandensis, Higgins and Petterd.
„ leucogenys, „ „
„ niger, „ „

Species of Muridæ :—
Mus setifer.
„ penicillatus.
„ fuscipes.
„ velutinus, Thomas, Ann. and Mag. Nat. Hist., June, 1882.
Mastacomys fuscus, Ann. and Mag. Nat. Hist., June, 1882.
Mus griseocæruleus, Higgins and Petterd.
„ leucopus, „ „
„ variabilis, „ „
„ Simsoni, „ „

# DESCRIPTION OF A NEW SPECIES OF FISH, CAUGHT NEAR EMU BAY, TASMANIA.

By Robt. M. Johnston, F.L.S.

[*Read 14th November*, 1882.]

## LOPHOTIDÆ.

Tænioidei, part., Cuvier.

*Body elongate, strongly compressed*, naked; eye lateral; *cleft of the mouth narrow*, with the dentition feeble; vent situated near extremity of the tail; one dorsal fin, occupying the whole length of the back, composed of flexible rays, which do not show either articulated joints or branches; anal short; caudal in the longitudinal axis of the fish; ventrals thoracic; gill opening wide; branchiostegals six; gills four; pseudobranchiæ; muscles coherent.

## 1. LOPHOTES.

LOPHOTES, Giorna, Mem. Acad. Torino, IX., 1803, p. 19. Cuv. Règne An.

Head elevated into a very high crest, at the anterior extremity of which the dorsal fin commences; the vent is situated near the extremity of the tail; a small anal fin behind it; ventrals and caudal small, the former thoracic; mouth protractile, subvertical; teeth in the jaws, on the vomer, and on the palate; air bladder present.

LOPHOTES GUNTHERI (n. s.)

B. 6. D. 221·36. A. $\frac{6}{14}$. P. 14. V. ⅕. C. 15.

The height of the body is contained 5⅗ times in the total length, and the length of the head 8⅓ times; eye very large. The first spine, in the specimen being described, had been broken off close to the anterior point of elevated soft crest, and is somewhat compressed and moderately strong. The rays of dorsal immediately over the eye are about ½ inch in length, gradually increasing to 2½ inches long behind the extremity of pectoral, and from thence gradually diminishing towards a point measuring 1½ inches from extremity of caudal fin, where a second rudimentary series of about 36 rays connects the principal series with the caudal fin; caudal fin composed of 14 rays unsymmetrical, and terminals bending slightly upwards; anal fin small, measuring ¾ inch long, and ¾ inch deep; the first six rays are simple; ventral ⅕, rudimentary, scarcely ¼ inch long; fins pinkish-yellow; sides uniformly silvery, with reticulated markings resembling scales—208 series longitudinally, and 65 transversely.

The above singular fish is closely allied to the ribbon fish family. It was caught recently on the North-West Coast, near Emu Bay, and subsequently presented to the Fisheries Exhibition Commission by Mr. John Swan. Dr. Gunther states that the fishes of this family are of very rare occurrence, and hitherto only known to exist in the seas of Japan and Mediterranean. Only one species, *Lophotes Cepedianus*, Giorna, is described in Dr. Gunther's Cat. of the Fishes of the British Museum. The Japanese species, *Lophotes Capellei*, Schleg., is stated by the same authority to be doubtfully distinct *from L. Cepedianus*, of the Mediterranean. It is of *great interest to find* a representative of this singular family in Tasmanian waters. The specimen described was photographed while in a fresh state, and the latter will in future be serviceable for identification.

| | | |
|---|---|---|
| Total length | 43¾ | inches. |
| Length of body | 42½ | „ |
| „ head | 5¼ | „ |
| „ snout | 1½ | „ |
| Depth behind shoulder | 7¾ | „ |
| „ near middle | 7 | „ |
| „ in advance of anus | 5 | „ |
| „ over anus | 1½ | „ |
| „ at caudal | ¾ | „ |
| Length of pectoral ray | 2¼ | „ |
| Diameter of eye | 2 | „ |
| Greatest thickness of body | 1⅝ | „ |

# METEOROLOGY.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN AT HOBART DURING PART OF THE YEAR 1882, BY COMMANDER SHORTT, R.N., GOVERNMENT OBSERVER.

Latitude, 42° 53′ 24″ S.; Longitude, 147° 20′ 7″ E. Height of Observatory above Mean Sea Level, 130 feet. Barometer corrected to 32° Fahrenheit, and reduced to Mean Sea Level.

| 1882. | MEAN OF BAROMETER. | | | MEAN SHADE TEMPERATURE OF AIR. | | | MEAN HUMIDITY | THERMOMETERS IN SHADE. | | | | | | RAIN. | | PREVAILING WINDS. | | CLOUDS. | DEW POINT. | PRESSURE OF VAPOUR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 A.M. | 3 P.M. | 9 P.M. | 9 A.M. | 3 P.M. | 9 P.M. | Month. | Maximum. | Mean Maximum. | Minimum. | Mean Minimum. | Mean Diurnal Range | Mean Temperature of Month. | Total Fall. | No. of Days Rain fell. | Direction. | Force. | Amount. | | |
| | Inches | Inches | Inches | | | | | | | | | | | Inches | | | 0-12 | 0-10 | | |
| April | 29·716 | 29·671 | 29·699 | 55·8 | 58·3 | 52·1 | ·814 | 74·8 | 61·5 | 37·0 | 45·2 | 16·3 | 54·4 | 0·9 | 13 | West and Calm. | 1·3 | 5 | 48·5 | ·346 |
| May | 29·704 | 29·641 | 29·655 | 48·4 | 53·7 | 48·6 | ·816 | 62·5 | 55·4 | 34·8 | 43·0 | 12·4 | 50·2 | 5·91 | 16 | South and West. | 1·8 | 5·9 | 43·9 | ·297 |
| June | 29·791 | 29·746 | 29·754 | 42·6 | 49·6 | 44·7 | ·823 | 58·2 | 50·3 | 33·0 | 38·3 | 12·0 | 45·6 | 2·415 | 13 | West. | 1·5 | 6 | 40·4 | ·251 |
| July | 29·669 | 29·660 | 29·696 | 44·3 | 50·3 | 43·8 | ·785 | 59·0 | 50·9 | 31·0 | 38·9 | 12·0 | 44·5 | 2·141 | 13 | N.W. & S.W. | 2·3 | 5·25 | 38·1 | ·230 |
| August | 29·861 | 29·809 | 29·834 | 46·6 | 51·9 | 45·8 | ·821 | 60·8 | 52·2 | 33·6 | 40·7 | 11·5 | 48·1 | 4·82 | 12 | N.W. & South. | 1·4 | 6 | 42·9 | ·276 |
| September | 29·515 | 29·461 | 29·504 | 51·6 | 56·2 | 49·7 | ·754 | 67·2 | 58·3 | 37·2 | 44·2 | 14·1 | 52·4 | 2·03 | 18 | N.W. | 3·4 | 6·6 | 44·8 | ·297 |
| October | 29·729 | 29·683 | 29·743 | 56·4 | 58·3 | 51·6 | ·732 | 72·0 | 61·0 | 37·5 | 46·3 | 14·7 | 55·5 | 3·79 | 13 | N.W. & S.E. | 2·5 | 6 | 47· | ·323 |
| November | 29·847 | 29·783 | 29·856 | 63·9 | 63·9 | 53·8 | ·724 | 88·0 | 60·7 | 42·0 | 51·6 | 18·1 | 61·7 | 2·05 | 13 | W.N.W. & E.S.E. | 2·4 | 5·5 | 53·1 | ·404 |
| December | 29·628 | 29·579 | 29·644 | 64·0 | 64·2 | 57·0 | ·745 | 86·3 | 60·9 | 45·7 | 53·2 | 16·7 | 61·7 | 2·608 | 16 | W.N.W. & E.S.E. | 1·8 | 7 | 53·5 | ·410 |
| Mean | 29·718 | 29·670 | 29·709 | 52·6 | 56·3 | 49·7 | ·779 | 69·9 | 58·8 | 36·9 | 44·6 | 14·2 | 52·7 | Total, 27·564 | Total, 127 | W.N.W. & S.E. | 2· | 5·9 | 45·8 | ·315 |
| Mean of the three Recordings | 29·699 | | | 52·9 | | | | | | | | | | Mean, 8·063 | Mean 14 | | | | | |

Showing the Lati ch Month, and Total Rainfall.

| *Name of Station.* | *Latitude, South.* | | SEPT. | | OCTOBER. | | NOVEMBER. | | DECEMBER. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Wet Days.* | *Rainfall.* | *Wet Days.* | *Rainfall.* | *Wet Days.* | *Rainfall.* | *Wet Days.* | *Rainfall.* |
| | South. | | No. | Inch. | No. | Inch. | No. | Inch. | No. | Inch. |
| | ° ′ ″ | ° | | | | | | | | |
| **Hobart** ............... | 42 53 24 | 147 | 18 | 2·93 | 13 | 3·79 | 13 | 2·05 | 16 | 2·61 |
| **Southport** ........... | 43 26 0 | 147 | 21 | 5·37 | 12 | 3·51 | 8 | 1·90 | 13 | 2·30 |
| **Falmouth**........... | 41 32 0 | 148 | 9 | 1·26 | 7 | 1·68 | 5 | 1·55 | 10 | 1·40 |
| **Fingal** ............... | 41 40 0 | 147 | 8 | 1·83 | 7 | 1·39 | 4 | 1·31 | 15 | 2·81 |
| **Killymoon, Fingal** | 41 35 0 | 148 | 13 | 1·26 | 7 | 1·09 | 8 | 2·35 | 16 | 2·23 |
| **Botanical Gardens, Hobart** ... | 42 52 0 | 147 | 18 | 2·45 | 12 | 3·16 | 10 | 1·81 | 16 | 2·91 |
| **Oatlands** ............ | 42 18 0 | 147 | 17 | 1·60 | 15 | 1·95 | 10 | 2·35 | 11 | 1·63 |
| **Low Head** ........... | 41 3 0 | 146 | 18 | 3·04 | 12 | 1·31 | 6 | 2·09 | 9 | 1·82 |
| **Circular Head**...... | 40 43 0 | 145 | 23 | 4·54 | 12 | 2·56 | 9 | 1·39 | 10 | 1·66 |
| **Strahan, Macquarie Harbour** | 42 11 0 | 145 | 24 | 8·63 | 12 | 3·84 | 9 | 3·27 | 9 | 4·20 |
| **Mount Bischoff** ... | 41 25 0 | 145 | 29 | 14·30 | 21 | 6·27 | 15 | 3·53 | 19 | 5·22 |

# PAPERS AND PROCEEDINGS

OF THE

# ROYAL SOCIETY

OF

# TASMANIA,

FOR

# 1883.

TASMANIA:
PRINTED AT THE "MERCURY" STEAM PRESS OFFICE, HOBART.
1884.

The responsibility of the statements and opinions given in the following papers and discussions rests with the individual authors; the Society as a body merely places them on record.

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# ROYAL SOCIETY.

## MAY, 1883.

The monthly evening meeting ot the Society was held on Tuesday, May 8, T. Stephens, Esq., V.P., in the chair.

Mr. Charles Percy Sprent, who had previously been nominated by the Council, was balloted for and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. Barnard) brought under notice the following returns, received since last meeting, viz. :—

Number of visitors to Museum :—
- January : On Sundays, 964 ; on week days, 1,420 ; total, 2,384.
- February : On Sundays, 986 ; on week days, 1,220 ; total, 2,206.
- March : On Sundays, 910 ; on week days, 1,805 ; total, 2,715.
- April : On Sundays, 1,165 ; on week days, 970 ; total, 2,135.

Number of visitors to Gardens :—
- January, total, 4,886 ; February, total, 5,014 ; March, total, 5,024 ; April, total, 4,497.

Plants, etc., received at Gardens :—
- From Messrs. Huber and Co., France, 27 packets seeds.
- From Messrs. Vilmorin, Andrieux and Co., five ditto.
- From M. A. Van Geert, Ghent, one box of ornamental deciduous trees and shrubs.
- Frome Mr. Thos. Gulliver, Townsville, North Australia, one case Australian orchids.
- From the Smithsonian Institution, Washington, U.S.A., 18 papers of seeds.
- From Mr. C. F. Creswell, Sydney, one bag of seed of Araucaria Bidwilli.
- From Baron Ferd. von Müeller, Melbourne, 54 papers seeds (various).
- From the Chamber of Agriculture, Washington, U.S.A., 12 papers of seeds.
- From Messrs. Vilmorin, Andrieux and Co., Paris, 5 papers seeds.

Plants, etc., sent from Gardens :—
- To Dr. Schomburgh, Adelaide Botanic Gardens, Sphagnum Moss.
- To Mr. Guilfoyle, Melbourne.
  - Botanic Gardens, Melbourne. To Mr. Chas. Moore, Botanic Gardens, Sydney, ditto. To De Smet Freres and Co., chest 32 Tree Ferns, and one case of Norfolk Island Pines. To A. Van Gaert, Ghent, 10 Tree Ferns. To Mr. C. F. Creswell, Melbourne, one case of mixed bulbs.
- Books and periodicals received.
- Presentations to Museum.

*Meteorological Returns :—*

1. Hobart, from Captain Shortt, Government Observer. Tables of observations for January, February, March, and April. Table of rainfall in Tasmania for 1882.
2. From Mr. Roblin. Abstracts and results of meteorological observations taken at the lighthouses, Tasmania, in 1882.

Results of the Hobart observations for January, February, March, and April.

January :—

*Barometer.—Mean, for month,* 29·834in.

*Thermometer.—Means:* Max., 71·4 ; min., 56·2 ; dry, 63·7 ; wet, 58·8.

Humidity.—Dew point : Mean, 55·3 ; elastic force of vapour, ·438; humidity, ·740.

Condensation.—Number of days on which rain fell, 9 ; amount collected, 3·60in.

Cloud.—Mean daily amount 7 (scale 0—10).

Wind.—Prevailing direction, E., S.E., N.W.; Mean force 1·9 (scale 0—12).

Remarks.—Rain fell on 9 days ; the heaviest fall registered, at 9 a.m. on the 17th, was 1·48in. The highest temperature in the shade was 84·2 on the 15th ; the lowest, on the night of the 17th, was 49·6. Light winds from E., S.E., and N.W., fine but cloudy weather. The lowest reading of the Barometer was 29.350 at 3 p.m. on the 20th ; the highest 30·237, at 9 p.m. on the 17th.

February :—

Barometer.—Mean : 29·707.

Thermometer.—Mean : Max., 69·5 ; min., 55·5 ; dry, 62·6 ; wet, 58.

Humidity.—Dew point, 54·7 ; elastic force of vapour, ·428 ; humidity, ·753.

Condensation.—Number of days on which rain fell, 14 ; amount collected, 2·081.

Cloud.—Mean daily amount 7 (scale 0—10).

Wind.—Prevailing direction W., and E.S.E.

Remarks.—Rain fell on 14 days; the heaviest fall, 1·21in., at 9 a. m. on the 28th. Highest temperature in shade 80 on the 7th, the lowest 48 on the night of the 18th. Light winds from W. and E.S.E. Slight Aurora at 10 p.m. on the 8th. Thick misty weather from 9th to 12th. Vivid lightning on evening of 12th. Heavy rain on 27th and 28th. Thunder and lightning on evening of 27th. Thick fog on morning of the 28th, a gale of wind in the afternoon from S.W., continuing until next morning with heavy rain. The lowest reading of the Barometer was 28·755 at 3 p.m. of the 28th. The highest 30·132 at 9 a m of the 5th.

March :—

Barometer.—Mean, 29·906.

Thermometer.—Means : Max., 68·6 ; min., 55·6 ; dry, 64·3 ; wet, 59·7.

Humidity.—Dew point, 56·5 ; elastic force of vapour, ·457 ; humidity, ·758.

Condensation.—Number of days on which rain fell, 14 ; amount collected, 3·62 inches.

Cloud.—Mean daily amount 6.4 (scale 0—10).

Wind.—Prevailing direction, N.W. and S.S.E.

Remarks.—Rain fell on 14 days, the heaviest fall on any one day, 1·45in., was registered at 9 a.m. on the 1st. Highest temperature in shade 86, on the 8th, and in the sun 101, on the same day. The lowest temperature 48 on the night of 28th. Highest reading of the barometer, 30·207in., at 9 a.m., on the 23rd; the lowest, 29·485, at 3 p.m. on the 9th. Light winds from N.W. and S.S.E. during the month. Showery with winds from S.E. from 10th to 14th, and heavy rain on the 12th. Thick misty weather with light rain from 18th to 23rd.

April :—

Barometer.—Mean, for month, 29·901in.

Thermometer.—Means : Max., 63·7 ; min., 49·4.

Dry bulb, 59·1 ; wet bulb, 55.

Humidity.—Dew point, 51·8 ; elastic force of vapour, ·385 ; humidity, 768.

Condensation.—No. of days on which rain fell, 9 ; amount collected, 0·48in.

*Cloud.*—Mean, daily amount, 5.8 (scale 0—10.)

*Wind.—Prevailing direction,* S., and N.W., mean force, 1·8 (scale—*0·12.)*

Remarks.—The rainfall for the month was very slight, being only 0·48 inches. Highest temperature in shade 73·5 on the 3rd; the lowest 43 on the night of 23rd. Winds light from N.W. and S. Thick fog on the Derwent on the morning of the 29th. Mr. O. C. Heiden reports that three distinct shocks of earthquake were felt at Gould's Country on 12th and 13th. The middle of the eclipse on the evening of the 22nd was well defined, although scud was driving across the moon from the S.E. A lunar rainbow was observed previous to the eclipse, and a halo round the moon during its continuance.

RAINFALL 1883.

| Station. | January. | | February. | | March. | | April. | |
|---|---|---|---|---|---|---|---|---|
| | Days. | Amount. | Days. | Amount. | Days. | Amount. | Days. | Amount. |
| | | Inches. | | Inches. | | Inches. | | Inches. |
| Hobart ... ... | 9 | 3·60 | 14 | 2·08 | 14 | 3·62 | 9 | 0·48 |
| Botanic Gardens ... | 11 | 3·57 | 14 | 1·61 | 13 | 2·75 | 6 | 0·42 |
| Southport ... ... | 8 | 3·13 | 10 | 4·11 | 12 | 4·65 | 10 | 0·73 |
| Fingal ... ... | 7 | 2·35 | 11 | 2·57 | 4 | 2·91 | 4 | 0·72 |
| Falmouth ... ... | 10 | 1·78 | 13 | 3·67 | 9 | 1·62 | 3 | 0·51 |
| Oatlands ... ... | 7 | 2·54 | 9 | 2·29 | 10 | 4·87 | 7 | 0·37 |
| Low Heads ... ... | 7 | 0·55 | 8 | 1·75 | 12 | 2·74 | 7 | 0·93 |
| Mount Bischoff ... | 13 | 1·60 | 17 | 4·07 | 19 | 5·87 | 18 | 3·02 |
| Circular Head ... | 7 | 1·03 | 8 | 2·68 | 14 | 4·20 | 13 | 1·79 |
| Macquarie Habour... | 5 | 2·05 | 5 | 2·03 | 6 | 2·35 | — | — |
| Killymoon, Fingal... | — | — | 11 | 3·34 | 12 | 2·55 | 8 | 0·78 |
| Launceston ... ... | — | — | — | — | 15 | 2·03 | 11 | 1·12 |

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during January, February, March and April, 1883 :—

January :—
7th. Veronica augustifolia in full flower.
10th. First ripe Apricot gathered (Roman).
14th. Grevillea robusta in full flower.
14th. Jargonelle Pear commencing to ripen.
20th. Catalpa syringfœolia in flower.
31st. Mulberries commencing to ripen.

February :—
7th. Kerry Pippin commencing to ripen.
8th. Windsor Pear commencing to ripen.
10th. Bon chretien commencing to ripen.
14th. Greengage Plum commencing to ripen.

(In a note appended to this return Mr. Abbott remarks :—"Owing to the continued showers during the season the ash and sycamore are retaining their leaves much longer than usual.")

March:—
10th. Tips of horbeam turning yellow.
20th. Seckle pair ripe.
24th. Golden Drop Plum (Coes) ripe.
24th. Tips of Elm turning yellow.
26th. Tips of Horsechestnut turning brown.
31st. Ash leaves commencing to fall.
31st. Oak leaves commencing to fall.

April :—
14th. Chinese chrysanthemum in flower.
15th. Elm leaves commencing to fall.
16th. Coes late red plum commencing to ripen.
22nd. Pyrus aucuparia leaves commencing to fall.
28th. Black Mulberry leaves commencing to fall.
30th. Seeds of hornbeam ripe.

The presentations to the Museum were as follow :—

1. From A. T. Clerk, Esq. 17 spears, 2 throwing sticks, 1 shield, 1 stone axe, and 5 baskets made and used by the Aborigines near Cashmere Station, North Kennedy District, Cardwell, Queensland.
2. From Mr. G. Elliot, Melbourne. 34 Brazilian birds, and a fine pair of horns of the Cashmere Water Buffalo.
3. From Miss Edgar. A prepared specimen of the fox shark, or "thresher," *(Alopecias vulpes)* caught in Auckland Harbour, New Zealand.
4. From Mr. W. Woodin. Fossils, Teeth, etc., from the Liverpool Plains, New South Wales, stated to have been found lying on the bed rock at a depth of 115 feet from the surface.
5. From Mr. H. J. Warner. Slab of fine Clay, with Fern Impressions, from York Plains Coal Mine, Cast of Spirifer.
6. From Mr. R. Brown. Two samples of Tin from the claim of the Empress Company, Koetong, Victoria.
7. From Mr. W. Rayner, New Norfolk, Specimens of Iron Pyrites and silicified wood from Chariemont.
8. From R. P. Adams, Esq. Specimen of Asbestos, from Mount Bischoff.
9. From Mr. C. Basstian. 10 Maori stone Axes, in various stages of manufacture, from Woodstock, New Zealand.
10. From Mr. C.W.S. James. Fragments of boulder encrusted with crystals of carbonate of lime, from Waterworks, Hobart.
11. *From Mr. J. E. Evans.* Specimens of Tin Ore from Ben Lomond *Mine.*

12. From Col. Crawford. Specimen of Sucking Fish (Echeneis remora).
13. From Mrs. Wm. Crosby, jun. Specimen of Shell and animal of Nautilus.
14. From Mr. E. D. Swan. A Diamond Snake *(Morelia spilotes)* from the Quarantine Station, Sydney, prepared and mounted.
15. From the Hon. the Minister of Lands and Works, N. J. Brown. Model of a Gold Nugget found at the Whyte River, Tasmania, by McGinty and party, February 18, 1883. Weight, 243oz.
16. Ditto from the same locality, found by Griffin and party, March, 1883. Weight, 143oz. 6dwts.
17. From Mr. C. Edge. A diamond snake *(Hoplocephalus superbus)* from near Hobart Waterworks.
18. From Mr. J. Whittaker. A large black snake *(Hoplocephalus curtus)* from Cascade Gully.
19. From Mr. C. Glover. Rock specimens. Copper ore, etc., from High Rocky Head, West Coast, Tasmania.
20. From Messrs. G. C. Westbrook and Edward Young, specimen of the Port Jackson shark *(Cestracion Philippi)*.
21. From Mr. Hume. Fossil leaf impressions from N. S. Wales.
22. From Mr. W. F. Petterd. Specimens of new species of Tasmanian mammals described in a paper by Dr. Higgins and the donor.
23. From Mr. H. H. Baily. Two large specimens of silver lead ore from Mount Claude.
24. From Mr. Thos. Davis. Plates of baleen (whalebone) from Cloudy Bay Beach, D'Entrecasteaux Channel.
25. From Mr. John Page. An aboriginal stone implement from the Eastern Marshes.
26. From Mr. T. Stephens. Three specimens of Tasmanian Woods polished, viz., native sandal wood *(Alyxia buxifolia)*, Red pine (*Athrotaxis sclaginoides*) and pencil cedar pine (*Athrotaxis cupressoides.*
27. From Master J. A. Murphy. Specimens of small crustaceans *(Grimothea gregaria?)* recently washed on shore in immense numbers at Howrah, Kangaroo Point, and the adjacent bays.
28. From Mr. John Cotton, Earlham, Orford. A large file, thickly encrusted with oxide of iron, found in the Sandspit River. (In reference to this presentation Mr. Cotton remarks, "I am at a loss to conjecture how such an instrument could get where found. I have resided here now 25 years and never had a file of the kind, and the very few and far between visitors who come to our river are poor fishers, not likely to be possessed of an implement of that description. It would be interesting to know its history.")
29. From Dr. Barnard. 25 specimens of minerals, etc., chiefly from New South Wales, viz., model of a gold nugget weighing 64oz., found near Gulgong, N.S.W. Gold-bearing copper ore from Mitchell's Creek. Ditto, copper ore from Girilambone, ditto. Ditto, containing 56 per cent. of copper, from Wellington, N.S.W. Ditto (best) from Girilambone. Ditto, peacock and yellow, from Gulgong, N.S.W. Ditto, ditto, from Wellington. Native copper, from ditto. Green carbonate of copper in crystals. Silver ore from Narangarie, N.S.W. Ditto, from Boorook, ditto. Gold and mineral-bearing quartz from Wellington, N.S.W. Ore of zinc and iron from Bolara, N.S.W. Lead ore from near Gulgong, N.S.W. Specimen of fossil wood. Ore of Bismuth from New England, N.S.W. Cinnabar from Cudgegong. Nickel ore from New Caledonia. Crystals of iron pyrites. Ditto from silver mines of Potosi, *South America.* Three specimens of fossil leaf im-

pressions, and two of fossil wood from Gulgong. Surveyor's mark cut in a native apple tree, on the Macintyre River, and overgrown by new wood 1½ inches thick in eight years.

The SECRETARY read a paper on "New Species of Tasmanian Antechini and Mus," by Edmund T. Higgins, M.R.C.S., England, F.L.S., and William F. Petterd, C.M.Z.S.

The CHAIRMAN remarked that some incidental reference had already been made to the proposed establishment of an Australasian Geographical Society, of which some of the Fellows present had seen notices in the *Sydney Morning Herald.* The scheme was first mooted by a committee of the Royal Society of New South Wales; but it had been thought advisable to found the institution on a wider basis, in order to secure the co-operation of all the Australasian colonies in furtherance of the objects of the new Society. These are briefly stated to be "the advancement of geographical science and the study of the physical and commercial geography of the world, more especially that of Australasia. The society would fill up a great gap in the education of the people, and public lectures would be given on all countries illustrative of their commerce, productions and industries." He (Mr. Stephens) thought he might say that although it would be premature to discuss the matter until the constitution, objects, and mode of procedure of the society were more fully defined, there would be no difference of opinion among the Fellows present as to the importance of the subject, and that further information would be gladly received.

Some conversation in favour of the proposed society followed the remarks of the Chairman, reference being made to the prevailing want of geographical knowledge of this group of colonies, particularly in the Mother Country.

Mr. C. H. GRANT then moved, "That the thanks of the meeting be accorded to the authors of the paper read, and to the donors of the various presentations."

Dr. PERKINS seconded the motion, and referred to the numerous additions to the museum, and especially to the varied collection of mineral specimens from N.S.W. presented by Dr. Barnard.

The motion having been unanimously agreed to the proceedings terminated.

## JUNE, 1883.

The monthly evening meeting of the Society was held on Tuesday, 12th June, C. H. Grant, Esq., in the chair.

The following gentlemen, who had been previously nominated by the Council, were balloted for and declared duly elected as Fellows of the Society, viz., Captain Shortt, R.N., Mr. William Humphrey Page, Bengal Civil Service, and Mr. James Fincham, C.E.

The Hon. Secretary (Mr. Barnard) brought forward the following returns for the past month, viz.:—

1. Number of visitors to Museum:—
   On Sundays, 1,387; on week days, 425; total 1,812.
2. Ditto to Gardens, total, 4,467.
3. Plants, etc., received at Gardens:—
   From Messrs. Shepherd and Co., Sydney, seeds of 18 species of eucalypti.
   From the Botanic Gardens, Melbourne, seeds of 24 species of palms.
   From Baron Von Mueller, 150 packets seeds.
   From Mrs. R. P. Harris, 30 packets seeds from the Botanic Gardens, Saharunpore, India.
   From Mr. J. Smith, Victoria, 12 plants.
   From Messrs. Vilmorin and Co., Paris, 5 packets seeds.

4. Plants sent from Gardens :—

To Mr. G. Brunning, Melbourne, 1 case assorted plants.

5. Books and periodicals received.

6. Presentations to Museum.

*Meteorology* :—

1. From Captain Shortt, Government Observer. Table of observations at Hobart for May.
2. Table of rainfall at 13 stations in Tasmania.

The following are the results of the Hobart observations for May :—

Barometer.—Mean : 29·830in.

Thermometer.—Means : Max., 56·6; min., 42·2 ; dry, 50·7 ; wet, 47·4.

Humidity.—Dew point, 44·1 ; elastic force of vapour, ·289 ; humidity, ·781.

Condensation.—Number of days on which rain fell, 12 ; amount collected, 1·70in.

Clouds.—Mean daily amount, 6·4 ; (scale, 0—10).

Wind.—Mean force, 1·8 ; (scale, 0—12). Prevailing direction, N.W. and south.

Remarks.—Rain on 12 days ; the heaviest fall on any one day was 0·56in., registered at 9 a.m. on 27th. Highest temperature in shade, 69·2 on the 5th ; the lowest, 34·8, on the night of the 13th. Highest reading of barometer, 30·476 at 9 p.m. of the 11th ; the lowest, 29·326 at 3 p.m. of the 20th. Light winds from south and N.W. Snow on Mount Wellington on 8th and 18th. From the 5th of the month fogs have been very prevalent. Shocks of earthquake were felt at Gould's Country on the 17th, 18th, 28th, and 29th. They have also been felt at different places between the parallels of 41 and 42 S., and to the eastward of Longford. Some of the shocks have been reported as very severe. 2·30 inches of rain fell at Gould's Country in 6 hours on the 6th.

Rainfall in Tasmania, May, 1883 :—

| | | | | | |
|---|---|---|---|---|---|
| Southport, | rain fell on | 18 | days; | amount | 3·46. |
| Hobart City | ,, | 12 | ,, | ,, | 1·70. |
| Hobart Bot. Gardens | | 8 | ,, | ,, | 1·58. |
| Oatlands | ,, | 5 | ,, | ,, | 1·38. |
| Fingal | ,, | 6 | ,, | ,, | 1·74. |
| Falmouth | ,, | 8 | ,, | ,, | 1·50. |
| Launceston | ,, | 12 | ,, | ,, | 1·86. |
| Low Head | ,, | 7 | ,, | ,, | 1·39. |
| Mt. Bischoff | ,, | 21 | ,, | ,, | 4·05. |
| Circular Head | ,, | 15 | ,, | ,, | 5·68. |
| Gould's Country | | 7 | ,, | ,, | 4·75. |

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during May :—

10th. First medlar ripe.

22nd. Calycanthus præcox commencing to flower.

24th. Photinia serrulata, ditto.

26th. Diosma alba, ditto.

27th. Ailanthus leaves all fallen.

30th. Lonicera fragrantissima commencing to flower.

The following presentations were announced :—

1. From Mr. Geard. A grey flying Opossum (*Belideus sciureus*), killed at Broadmarsh.
2. From Mrs. Lamb, Jerusalem. A fine greenstone image of the Maori god "Tiki," from New Zealand.
3. From Mr. C. W. S. James. A nodule of limestone from a cavity in which a living frog was said to have been taken.
4. From Dr. Haast, Director of Museum, Christchurch, New Zealand. The caudal vertebræ of a moa (*Dinornis giganteus*).

5. From the author, the Rev. P. MacPherson, A.M., Sydney. "A Lecture on the Religion of the Aborigines of Australia."
6. From the Victorian Chamber of Commerce. A paper on Australian Wines, by Leo. Moonen.
7. From the New Zealand Institute. Transactions and Proceedings of the Institute, Vol. 15, 1882.

The attention of the meeting was called to a collection of beautifully preserved fossils from the Tertiary Beds at Table Cape, which had been forwarded by the owner, Mr. Tofft, for exhibition only.

Mr. F. **Abbott** read a paper entitled "Notes on New Plants introduced into the Royal Society's Gardens during 1882."

After the reading of this paper a long and interesting discussion ensued, in which Mr. C. H. Grant, Mr. E. D. Swan, Mr. Belstead, Mr. Abbott, and Mr. Barnard took part.

The Rev. J. **Wilkes Simmons** remarked that on his recent visit to Sydney he had sought information as to the newly-formed Geographical Society of Australasia, referred to at last meeting, and read the following note on the subject:—"The objects of the Geographical Society of Australasia are scientific, commercial, and educational. The first point embraces the exploration of unknown and imperfectly known parts of Australasia; the second, the study of the natural and artificial products of various countries and their industries; and the third, the promotion of the knowledge of physical, commercial, and political geography amongst all classes by means of illustrated public lectures and various publications. This scheme includes the collection of information for the compilation of a reliable geography of Australasia. It is intended that the society shall consist of honorary, corresponding, and ordinary members. The first, persons who have rendered valuable services in the cause of geographical science; the second, residents of Australasia elected for their promotion of the interests of the society. Any lady or gentleman may become an ordinary member, subject to election. Colonies joining in the movement are styled provinces—thus: 'the province of New South Wales,'—and three members from each associated province have seats at the Board of the General Council. The members of the society in any associated province may elect a local committee. Reports of the transactions of the society will be published, including reports from local committees."

Votes of thanks having been accorded to Mr. Abbott and the Rev. J. W. Simmons for their communications, the proceedings closed with a similar acknowledgment to the donors of presentations.

## JULY, 1883.

The monthly evening meeting of the Society was held on Tuesday, 10th July, T. Stephens, Esq., V.P., in the chair.

The hon. secretary, Mr. Barnard, called attention to the following returns for the month of June, viz.:—

1. Visitors to Museum:—

On Sundays, 1,185; on week days, 934; total, 2,119.

2. Ditto to Gardens, total, 3,696.
3. Plants, etc., received at Gardens:—

From Mr. A. Wilson, Dunedin, one box of New Zealand ferns.
From Mr. G. Brunning, Melbourne, 100 plants, (various).
From Col. Crawford, Castra, seeds of *Poivrea Doccinea*.
From Mr. J. Smith, Victoria, 9 plants.
From Mr. Owen Meredith, seedlings of Douglas River pine.

4. Plants, etc., sent from Gardens:—

*To Mr. G.* Brunning, Melbourne, a collection of seeds.

To Baron Von Mueller, ditto.
To Messrs. Shepherd, Sydney, ditto.
To Mr. J. Smith, Victoria, ditto, and case of plants.
To Mr. T. Gulliver, Townsville, Queensland, collection of seeds.
To Mr. C. Creswell, Victoria, ditto.

5. Periodicals received.
6. Presentations to Museum and Library.

*Meteorology* :—

1. From Captain Shortt, Government Observer. Table of means of observations for June.
2. Table of rainfall at 12 stations in Tasmania.
3. From the Government Observer, Wellington, New Zealand. Printed tables for March and April.

The following are the results of the Hobart observations for June :—

Barometer.—Mean : 29·708in.

Thermometer.—Mean : Max., 57·4 ; min., 45· ; dry, 51·8 ; wet, 48·3.

Humidity.—Dew point, 44·9 ; elastic force of vapour, ·298 ; humidity, ·774.

Condensation.—Number of days on which rain fell, 17 ; amount collected, 1·61in.

Clouds.—Mean daily amount, 6·9 ; (scale, 0—10).

Wind.—Mean force, 2·6 ; (scale, 0—12).

Remarks.—The month has been an unusually mild one, the mean temperature being 6· higher than that of June, 1882. Rain fell on 17 days, the heaviest fall on any one day was 0·33in. on the 4th. Highest temperature in the shade, 62·3 on the 14th ; the lowest, 39·2 on night of 2nd. Highest reading of the barometer, 30·162in. at 9 a.m. of the 11th ; the lowest, 28·908in. at 9 p.m. of the 22nd. Snow fell on Mount Wellington on 22nd, 23rd, and 29th. Fogs, some very dense, prevailed during the first part of the month. Winds chiefly from W.N.W., blowing hard on the 16th and 17th, and a strong gale on the 25th. Very heavy rains in northern portion of the colony. Heavy shocks of earthquake have been felt at Gould's Country and in that vicinity during the month.

Rainfall in Tasmania, June, 1883 :—

| | | | | |
|---|---|---|---|---|
| Southport, rain fell on | 10 | days ; | amount | 2·46. |
| Hobart ,, | 17 | ,, | ,, | 1·61. |
| Ditto (Bot. Gardens) | 16 | ,, | ,, | 1·67. |
| Oatlands ,, | 8 | ,, | ,, | 1·55. |
| Fingal ,, | 7 | ,, | ,, | 2·08. |
| Ditto, (Killymoon) | 16 | ,, | ,, | 1·67. |
| Falmouth ,, | 8 | ,, | ,, | 1·47. |
| Launceston ,, | 20 | ,, | ,, | 6·16. |
| Low Heads ,, | 19 | ,, | ,, | 5·20. |
| Mt. Bischoff ,, | 28 | ,, | ,, | 12·78. |
| Circular Head | 20 | ,, | ,, | 5·44. |
| Gould's Country | 15 | ,, | ,, | 11·36. |

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during June :—

12th. Calycanthus præcox in full flower. 14th. Early narcissus commencing to flower.
18th. Maclaura aurantiaca, leaves commencing to shed.
22nd. Privet, ditto.
26th. Snowflake commencing to flower.
28th. Iris alata, ditto.
30th. Black mulberry leaves all shed.

The presentations were as follows :—

To Museum:—1. From Dr. E. T. Higgins, and Mr. W. F. Petterd, male and female *type specimens* of a new cave-inhabiting spider

*(Theridion troglodytes)*, from a recently discovered cave in the Chudleigh district.

2. From the same. A collection of mammalian remains from the cave referred to above.

(These presentations are illustrative of a paper contributed by the donors).

To Library:—

1. From the Royal Society of Victoria, Proceedings of the Society. Vol. 19, 1882.
2. From Government of Tasmania, House of Assembly journals, Vols. 42, and 43.
3. From Mr. G. McIntyre, Christchurch, Report of the Survey Department, New Zealand, 1881-2.

A paper entitled "Description of a new cave-inhabiting spider, together with notes on mammalian remains from a recently discovered cave in the Chudleigh district." By Edmund T. Higgins, M.R.C.S., Eng., F.L.S., and W. F. Petterd, C.M.Z.S., was read by the Secretary.

The proceedings closed with a vote of thanks to the authors of the paper, and to the donors of presentations.

## AUGUST, 1883.

The monthly evening meeting of the Society was held on Monday, 13th August, T. Stephens, Esq., V.P., in the chair.

The hon. Secretary, Mr. Barnard, brought forward the following returns for July, viz:—

1. Number of visitors to Museum:—On Sundays, 1,244; on week days, 1,125; total for month, 2,369.
2. Ditto to Gardens, total, 4,188.
3. Plants, etc., received at Gardens:—

From Messrs. J. Smith and Sons, Riddell's Creek, Victoria, 50 plants.
From Col. Crawford, seeds of *Poivrea coccinea*, from India.
From the Royal Gardens, Kew, seeds of *Rhus copallina*.
From Mr. C. F. Creswell, Melbourne, 30 plants.
From Baron Von Mueller, 3 packets seeds.
From Dr. Hector, Wellington, New Zealand, package of seeds.
Plants, etc., sent from Gardens:—
To Messrs. Law, Somner and Co., Melbourne, one case plants and seeds.
To Mr. W. R. Guilfoyle, director of Botanic Gardens, Melbourne, one case plants.
To Mr. C. F. Creswell, Melbourne, one package of seeds.

5. Presentations to Museum.
6. Ditto to Library. (The Secretary drew the special attention of the meeting to the valuable collection of books received during the past month from the United States Government, the Smithsonian and other scientific institutions in America, in exchange for the Society's Transactions. Also to the numerous publications of various learned bodies, in England and elsewhere, received in the same manner.)

*Meteorology*:—

1. Hobart.—From Captain Shortt, Government Observer, Table of means of observations for July.
2. From ditto, table of rainfall at 13 stations in Tasmania for July.

The following are the results of the Hobart observations for July:—

Barometer.—Mean: 29·773in.

*Thermometer.—Means: max.,* 52·9; min., 40·1; dry, 46·1; wet, 43·2.

**Humidity.**—Dew point, 39·8; elastic force of vapour, 0·245; humidity, 0·785.

**Condensation.**—Number of days on which rain fell, 12; amount collected, 1 23in.

**Clouds.**—Mean daily amount, 5·7; (scale, 0—10).

**Wind.**—Mean force, 2·1; (scale, (0—12.) Prevailing direction, South and W.N.W.

**Remarks.**—The highest temperature in the shade was 60 deg. on the 12th; the lowest, 31·5, and 30·5, on the nights of the 23rd and 24th respectively. The highest recording of the barometer, 30·248in. at 9 a.m. on the 30th; the lowest, 28·972in., at 3 p.m. on 27th. Fogs frequent on nights and in early mornings. Very sharp frosts on nights of 23rd and 24th. A gale of wind from westward on 11th and 12th. Slight shocks of earthquake have been felt frequently in the north and N.E. portions of the colony, but on the evening of the 30th, within a space of ten minutes, between 7.50 and 8 p.m., heavy shocks and loud rumblings were experienced all over those parts. Slight aurora observed at Low Heads on 30th, and at Launceston on 31st. The last four days very fine spring-like weather.

Rainfall in Tasmania, July, 1883:—

| | | |
|---|---|---|
| Southport, rain fell on | 18 days; amount | 4·97 |
| Hobart City ... | 12 ... ... | 1·22 |
| Bot. Gardens, Hobart | 14 ... ... | 1·09 |
| Oatlands ... ... | 3 ... ... | 0·92 |
| Fingal ... ... | 6 ... ... | 0·94 |
| Killymoon, Fingal | 12 ... ... | 0·96 |
| Falmouth ... | 5 ... ... | 0·44 |
| Launceston ... | 15 ... ... | 4·49 |
| Low Head ... | 13 ... ... | 2·58 |
| Mount Bischoff ... | 26 ... ... | 9·88 |
| Circular Head ... | 18 ... ... | 3·70 |
| Gould's Country... | 11 ... ... | 5.96 |

Time of leafing, flowering and fruiting of a few standard plants in the Botanic Gardens during July 1883:—

10th. Cytisus leucanthus, commencing to flower.
15th. Paper almond, ditto.
20th. Arbutus unedo, ditto.
21st. Garrya elliptica, ditto.
27th. Yellow crocus, ditto.
30th. White mulberry, commencing to break.

The presentations to the Museum were as follows:—

1. From Mr. J. H. Cowen. A "Brain Bowl," taken from a cannibal chief at "Tui Tui Coko," Fiji.
2. From Mr. J. R. McClymont. Specimen of sponge, from East Coast, Tasmania.
3. From Mr. P. Lee, Campbell Town. A male specimen of the musk duck, (*Biziura lobata.*)
4. From Dr. Higgins and Mr. W. F. Petterd, Launceston. Two specimens of a new species of native rat (*Mus tetragonurus*), named and described in a paper contributed by the donors.

The Secretary read a letter from a gentleman in New South Wales, addressed to a resident of Hobart, of which the following is an extract:—"We are in search of an authenticated portrait of Tasman, and so far have been unsuccessful. Possibly Tasmania might have such a thing, and you would be a likely person to say whether my surmise is correct. If it is, I feel sure you will aid the designer of our beautiful, but defunct, Garden Palace in getting an idea of the personal appearance of the ancient navigator after whom your tight little island is named. Perhaps you have a *bust or statue*, if not a picture, of the hero in Tasmania:

either would, I fancy, answer the purpose, as by photography a *fac simile* could be taken and utilised for the purpose for which the likeness is required."

Mr. Justin Browne remarks in a note—"In a cheap publication in Dutch, published about five years ago, giving Tasman's discovery of Van Diemen's Land there is no portrait of Tasman, nor do I believe there is one to be found in the Colony; but I believe there are three copies of a likeness of Governor Van Diemen in existence here, of which I possess one." Mr. Browne adds, "*The Times*, in noticing the Amsterdam Exhibition, mentions that portraits of the Colonial Dutch Governors were exhibited, but names are not given."

The REV. J. WILKES SIMMONS read a letter from the Hon. Secretary of the Geographical Society of Australasia, enclosing printed copy of rules, and asking for co-operation from the friends of Geographical Science in Hobart in forming a branch Society.

The SECRETARY expressed the fear that there was not sufficient scope for the formation of a distinct branch Society, important as it was in its objects—defined to be at once scientific, commercial, and educational—but undertook to bring the matter before the Council at its next meeting.

Mr. R. M. JOHNSTON read a "Notice of Additions to the list of Tasmanian Fishes, containing a description of a new species (*Olistherops Brownii*), and particularly referring to the recent successful introduction, by the Salmon Commissioners, into the Colony from New Zealand, of a species of Trout (*Salmo fontinalis*), a native of the rivers and lakes of North America.

Captain SHORTT read some introductory "Notes on earthquake shocks in reference to those reported to have recently occurred in the North and North-eastern parts of the island."

Mr. R. M. JOHNSTON drew the attention of the members to two important articles, in the Geological Magazine for April and June, 1883, upon the Tertiary Flora of Australia. One of the articles, written by Professor Dr. C. Baron von Ettingshausen, of the University of Graz, Austria, who is one of the first authorities in Europe, is in itself the substance of a paper read before the Imperial Academy of Sciences in Vienna, giving the results of a special examination of a large series of fossil plants from the Tertiary strata of New South Wales and Tasmania. The Tertiary deposits in the neighbourhood of Hobart have been largely referred to, and many new species have been determined therefrom. As it is very desirable that important articles bearing upon our own natural history should be accessible to local naturalists, Mr. Johnston recommended that the articles referred to be reproduced in the Proceedings of the Royal Society of Tasmania. Mr. Johnston also stated that it would be of the greatest benefit to local palæontologists if a copy of the original paper could be obtained and translated into English, in order that the new species determined could be identified with the names given; and he suggested that one of our Corresponding Members, Mr. Robert Etheridge, jun., of the British Museum, be asked to undertake the important task for the Society.

A general conversation ensued on the two papers read, after which votes of thanks, on the motion of Dr. Perkins, seconded by Mr. Atkins, were accorded to the authors, and also to the donors to the Museum and Library.

In introducing his paper Mr. JOHNSTON remarked that the two species now described by him (*Chilodactylus carponemus.* Parkinson, the "Old Man Perch," and *Sphyræna Nova Hollandiæ*, Gunther." "The Port Phillip Pike") were not embraced in his original catalogue of the fishes of Tasmania (1882). Dr. Richardson, nearly forty years ago, referred to the first mentioned species as inhabiting the waters in the neighbourhood of Port Arthur, but as the original description was defective, and as there was no record of its capture in Tasmanian waters since that time, it was inferred that the reference to Tasmania was erroneous. The fortunate capture of two fine specimens, one of them 29 inches in length, in 26 fathoms water, 14 miles off Tasman Island, now satisfactorily disposes of all doubt, and enables us to amend the defects of the original description, which was taken from a specimen preserved in spirits. The other species described has not hitherto been recorded as inhabiting Tasmanian waters, although common enough in those of the neighbourhood of the Victorian coast. The specimen now described was captured in Sandy Bay. It is allied to the common "Tasmanian Jack, or Pike," but is rounder, more slender, and elongate. The list of known Tasmanian fishes by these additions is raised to 197 species. Mr. JOHNSTON also, in the course of his remarks, suggested the desirableness of having a good representation of our fishes, suitably preserved, and exhibited in the Society's Museum.

Mr. STEPHENS gave some particulars of the alterations now nearly completed in the large room upstairs, and remarked that Mr. Roblin would soon find plenty of employment for volunteers able and willing to help in arranging the specimens in the new cases. After quoting from the report of a debate in Parliament some remarks on the official duties of the Chief Inspector of Schools, and his supposed devotion to the Royal Society, which caused some amusement, he went on to say that he regretted very much that the want of spare time had of late years prevented him from doing anything worth mentioning for the Royal Society, but he hoped that the good work already being done by other members would be rather increased than lessened in the future.

The proceedings terminated with a vote of thanks to Mr. Johnston for his paper, and to the donors of presentations.

## SEPTEMBER, 1883.

The monthly evening meeting of the Society was held on Monday, 10th September, Mr. C. T. Belstead in the chair.

The Secretary (Mr. Barnard) brought under notice the following returns for the past month, viz. :—

1. Number of visitors to Museum :—
   On Sundays, 1,065 ; on week days, 819 ; total, 1,884.
2. Ditto to Gardens, total, 4,434.
3. Plants, etc., received at Gardens :—
   From Dr. Hector, Wellington, New Zealand, a package of seeds.
   From Messrs. Shepherd, Sydney, one case of plants.
   From Messrs. Law, Somner and Co., Melbourne, one bundle of plants.
4. Seeds sent from Gardens :—
   To Ch. Huber and Co., France, one package of seeds.
   To Villmorin and Co., France, ditto.
   To Botanic Gardens, Cambridge, ditto.
   To Botanic Gardens, Calcutta, ditto.
   To the Horticultural Society, Madras, ditto.
   To the Botanic Gardens, Cape of Good Hope, ditto.
   To ditto, Natal, ditto.
   To Chamber of Agriculture, United States, ditto.
5. Books and Periodicals received.
   To Royal Gardens, Kew, ditto.
   To Calcutta Exhibition Commissioners, ditto.
6. Presentations to Museum.

*Meteorology :—*

1. Hobart, *from Captain Shortt*, Government Observer, weather report *for August.*

2. From ditto, table of rainfall at various stations through the colony.
3. From the Government Observer, Wellington, New Zealand, printed tables of observations for May and June.
4. From Mr. Ellery. Melbourne observations for May and June.

The following are the results of the Hobart observations for August :—

Barometer.—Mean of three daily observations, 29·601in.

Thermometer.—Means : max., 56·4 ; min., 43·4 ; dry, 50·5 ; wet, 45·9.

Humidity.—Dew point, 40·8 ; humidity, ·695 ; elastic force of vapour, ·255.

Condensation.—Number of days on which rain fell, 14 ; amount collected, 1·82in.

Clouds.—Mean daily amount 6·6 (scale, 0—10.)

Wind.—Mean force, 3 ; (scale, 0—12.)

Remarks.—The highest temperature in the shade was 64, on the 10th ; the lowest, 34·6 on the 3rd. The highest recording of the barometer 30·248in. at 9 a.m. on the 22nd ; the lowest, 28·809in. at 9 p.m. on the 11th. The rainfall was slight at Hobart and in the midland districts, but heavy at Mount Bischoff and Gould's country—at the former rain fell on every day of the month, to the amount of of 11·51in. Winds, chiefly from the N.W. ; gales on the 6th, 14th, and 26th. Snow fell on Mount Wellington several times during the month. Shocks of earthquake have been felt in the same parts of the colony as previously visited. The strongest shock yet felt occurred, nearly simultaneously, over the whole of the disturbed district, a little before and after 9 a.m. on the 30th. There was a tidal disturbance at the Huon on the 28th and 29th, the tide coming in with great speed and force, throwing up, in several places, mounds of mud 3ft. high.

Rainfall in Tasmania, August 1883 :—

| | | | | | in. |
|---|---|---|---|---|---|
| Southport, rain fell on | | 23 | days; | amount, | 4·76 |
| Hobart, City | ,, | 14 | ,, | ,, | 1·82 |
| Botanic Gds., Hobart | | 16 | ,, | ,, | 1·37 |
| Oatlands | ,, | 8 | ,, | ,, | 0·74 |
| Fingal ,, | ,, | 10 | ,, | ,, | 0·81 |
| ,, Killymoon | | 10 | ,, | ,, | 0·51 |
| Falmouth ,, | ,, | 5 | ,, | ,, | 0·44 |
| Launceston | ,, | 19 | ,, | ,, | 3·32 |
| Low Head | ,, | 15 | ,, | ,, | 3·08 |
| Mount Bischoff | ,, | 31 | ,, | ,, | 11·51 |
| Circular Head | ,, | 23 | ,, | ,, | 3·34 |
| Gould's Country | ,, | 12 | ,, | ,, | 8·15 |
| Clarence Plains | ,, | 5 | ,, | ,, | 0·57 |

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during August, 1883 :—

14th. Gooseberries commencing to break.
15th. Common elm commencing to flower.
18th. Elder commencing to break.
20th. Lombardy poplar, ditto.
20th. Horse-chestnut, ditto.
28th. Royal apricot commencing to flower.

Presentations to Museum :—

1. From Master C. Hood. A squirrel from China.
2. From Messrs. Hawkins and Co., Shipwrights' Point. Two fish (Cyttus Australis.)
3. From Mr. B. R. Dyer. Two specimens of the peculiar lizard (*Omolepida casuarina*).

[In a note which accompanied this presentation, Mr. Dyer remarks :— *"I send two* fine specimens of the large, harmless, lizard, wrongly called *by the majority of people in* Tasmania the 'Death Adder.' While on *the subject of lizards,* could not a local be inserted in the Mercury and other papers on behalf of the poor harmless so-called 'Guana' (Sleeping Lizard). In my many business callings over all parts of Tasmania I have found a general desire to destroy these reptiles under the erroneous impression that they are venomous. It is very generally admitted that the sleeping lizard (*Cyclodus nigroluteus*) will attack and kill snakes; and I can certainly, of my own experience, assert that they will kill *young* snakes. What a pity then to destroy them!"]

The Hon. Secretary read a paper contributed by Dr. E. T. Higgins and Mr. W. F. Petterd, entitled a "Description of a new species of *Mus*, with a list of the terrestrial animals of Tasmania."

Conversational discussion ensued, and the meeting closed with the usual vote of thanks to the authors of the paper and to the donors of presentations.

## OCTOBER, 1883.

The monthly evening meeting of the Society was held on Monday, 8th October, Mr. C. H. Grant in the chair.

The Hon. Secretary (Mr. Barnard) brought forward the following returns for the month of September, viz.:—

1. Number of visitors to Museum:—
   On Sundays, 896; on week days, 735; total, 1,631.
2. Ditto to Gardens.—Total, 5,940.
3. Plants, etc., received at Gardens:—
   From Lady Dry, 24 varieties of seeds from Ceylon.
   From H. Low and Co., London, 1 case plants.
   From Mr. C. F. Creswell, Melbourne, 26 plants.
4. Sent from Gardens:—
   To Mr. C. F. Creswell, 1 case plants (various.)
5. Books and Periodicals received.
6. Presentations to Museum.

*Meteorology*:—

1. Hobart, from Captain Shortt, Government Observer, weather report for September.
2. From ditto, table of rainfall at various stations in Tasmania.

The following are the results of the Hobart observations:—

Barometer.—Mean. of three daily observations, 29·781in.

Thermometers.—Means.: Max. 58·4; Min., 42·3; dry bulb, 51·5; wet bulb, 47·1.

Humidity.—Dew point, 42·5; humidity, ·714; elastic force of vapour, ·272.

Condensation.—No. of days' rain, 11; amount collected, 1·99in.

Clouds.—Mean daily amount (0—10 scale); 6·7.

Wind.—Mean force, 2 (0—12); prevailing direction, N.W. and S.

Remarks.—The highest temperature in the shade was 69° on the 11th; the lowest, 37·2, on the night of the 22nd. Highest recording of the barometer, 30·233in. at 9 a.m. on the 16th; lowest, 28·840in., from 3 to 6 a.m. on the 3rd. The rainfall during the month was less than that of September, 1882, excepting in the S.E. portion of the colony, where it was greater. The heaviest fall registered in Hobart was 1·17in. on the 4th, and at Fingal 3¼in. on the 12th. A strong gale of wind blowing from the southward, on the 4th. In the latter part of the month the sky to the westward, for an hour or two after sunset, was illuminated with an unusually rose-tinted appearance, caused by the zodiacal light, seldom seen in the higher latitudes except at the beginning of spring to the westward, after sunset, and at the beginning of autumn to the eastward before sunrise. Earthquake shocks are still felt in the disturbed districts, the observers at Launceston and Falmouth report eight for the month.

Rainfall in Tasmania, September, 1883 :—

| | | | | | in. |
|---|---|---|---|---|---|
| Southport, | rain fell on | 9 | days ; | amount | 2·09 |
| Hobart, city | ,, | 11 | ,, | ,, | 1·90 |
| Ditto, Bot. Gardens | | 9 | ,, | ,, | 1·79 |
| Oatlands | ,, | 8 | ,, | ,, | 1·43 |
| Fingal | ,, | 6 | ,, | ,, | 4·43 |
| Ditto, Killymoon | ,, | 9 | ,, | ,, | 3.59 |
| Falmouth | ,, | 7 | ,, | ,, | 2·21 |
| Launceston | ,, | 11 | ,, | ,, | 2.54 |
| Low Head | ,, | 10 | ,, | ,, | 1·50 |
| Mount Bischoff | ,, | 21 | ,, | ,, | 3·96 |
| Circular Head | ,, | 14 | ,, | ,, | 2·80 |
| Gould's Country | ,, | 6 | ,, | ,, | 4.96 |
| Clarence Plains | ,, | 7 | ,, | ,, | 2·60 |
| Mount Nelson | ,, | 7 | ,, | ,, | 2.55 |

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during September 1883 :—

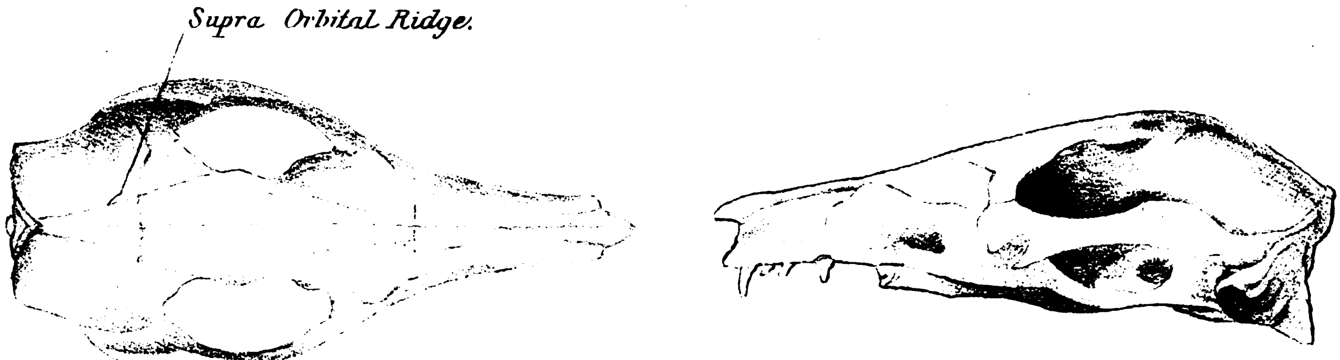
14th. Oak commencing to leaf.
16th. Mountain Peony commencing to flower.
23rd. Horse-chestnut, ditto.
24th. Sycamore commencing to break.
26th. Robinia Pseudo-Acacia, ditto.
22nd. Ash, ditto.
27th. Grape vines, ditto.
28th. Platanus orientalis, ditto.

Presentations to Museum :—

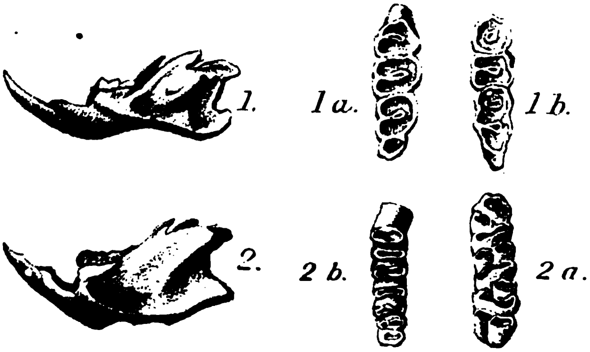
1. From Mrs. Lodder, the Leven, 89 specimens of Tasmanian Lepidoptera, including two of the Convolvulus Hawk Moth *(Sphinx Convolvuli.)*
2. From Mr. F. Tucker, per Mr. Pitt, Mona Vale. An Australian grebe (*Podiceps Australis*), shot at Lake Sorell.
3. From Mr. T. Merry. Specimen of sponge from near Tasman's Island.
4. From Mr. R. H. Davies, Torquay. Specimen of the radiated form of mica, with schorl, from Ruin Island, Furneaux Group, Bass' Straits (with note.)
5. From Mr. R. M. Johnston. A specimen of the "Port Phillip Pike," (*Sphyrœna Novæ Hollandiæ*) caught in Sandy Bay. (With a paper).
6. From the Hon. the Minister of Lands and Works. A mounted copy of the new map of Tasmania.
7. From Mr. William Knight, M.A., of Trafalgar Place. Specimens of sulphur and sulphate of lime from White Island, Bay of Plenty, New Zealand.

Mr. STEPHENS exhibited some fine specimens of precious opal from the borders of Queensland and New South Wales, found chiefly in very hard boulders derived from a volcanic formation.

Mr. R. M. JOHNSTON read a paper entitled : "Some further additions to the list of the known fishes of Tasmania."



Potorous Rufus Natural Size



1. *Mus Pachyurus*
1 a. Superior molars
1 b. Inferior molars

2. *Mus castaneus*
2 a. Superior molars
2 b. Inferior molars

# DESCRIPTIONS OF NEW TASMANIAN ANIMALS,

By Edmund Thos. Higgins, M.R.C.S., Eng., and Wm. F. Petterd, C.M.Z.S.

[*Read* 8*th May*, 1883.]

## Potorous Rufus—Nov. Species ♂

Fur very long, soft, somewhat glossy, of a rufous brown colour, base of the hairs leaden grey, annulated in the middle with yellowish brown, and darker at the tips, interspersed with long, dark, almost black hairs. Ears broad, roundly pointed, clothed internally with short, rufous brown hair, and externally with long dark brown hair forming at the margin a thick fringe. Under surface of body of a yellowish rust colour, base of hairs of a pale reddish brown. Fore and hind feet of a yellowish brown colour, the outer side of feet darker. Tail thickly clothed with somewhat short, stiff brown hairs, much darker on the upper surface, especially towards the end; the apical portion for about an inch and a quarter almost white. Muffle naked, with a naked, black, pear shaped space extending over the muzzle for about half an inch. The specimen described is quite adult; a second specimen of a much younger animal presents the same characters.

| | | |
|---|---|---|
| Length from tip of nose to root of tail ... | 12 | inches |
| „ of tail ... ... ... ... ... | $7\frac{1}{2}$ | „ |
| „ from nose to ear ... ... ... | 3 | „ |
| „ from nose to eye ... ... ... | 2 | „ |
| „ of ear ... ... ... ... ... | $1\frac{5}{8}$ | „ |
| Width of ear ... ... ... ... ... | $1\frac{1}{8}$ | „ |
| Length of fore feet and claws ... ... | $1\frac{1}{4}$ | „ |
| „ of hind feet and claws ... ... | $2\frac{7}{8}$ | „ |
| „ of skull... ... ... ... ... | $3\frac{1}{4}$ | „ |
| Width of skull ... ... ... ... ... | $1\frac{3}{8}$ | „ |
| „ of interorbital space ... ... ... | $1\frac{3}{16}$ | „ |
| Length of palatine bones ... ... ... | $1\frac{7}{16}$ | „ |
| „ of nasal bones... ... ... ... | $1\frac{5}{16}$ | „ |
| Width of nasal bones at the base ... ... | $\frac{5}{16}$ | „ |
| „ of nasal bones at the apex ... ... | $\frac{1}{16}$ | „ |
| Length of lower jaw ... ... ... ... | $1\frac{7}{8}$ | „ |
| „ of upper true molars ... ... ... | $\frac{1}{2}$ | „ |

The skull of adult Potorous rufus differs from that of Potorous murinus, in being more slender, in having the occipital crest nearly straight, the posterior orbital process less prominent, supra-orbital ridge extending from posterior orbital process to posterior junction of parietal bones (in P. murinus the supra-orbital ridge only extends as far as the anterior third of the parietal suture). In the skull narrow-ing suddenly opposite the prœmolar, from whence it curves regularly to the apex of the nasal bones. Space between the canines and prœmolars comparatively less; incisors very short; nasal bones short.

Habitat.—Long's Plains, from T. B. Moore, Esq.

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### Antechinus Moorei—Nov. Sp. ♂

Fur, long and soft; on the head and upper surface of body of a uniform rich umber brown, thickly interspersed with longer and much darker hair; base of fur slatey grey; on the under surface of the body the hair is of a more ashy tint, especially on the throat and chest. Ears of moderate length, internally and externally clothed with short hairs of the same colour as those on the upper surface of the body. Tail covered with rather long, dark brown hair, which at the apex forms a small brush. Fore and hind feet clothed with dark brown hair; nails long, especially those of the fore feet.

| | | |
|---|---|---|
| Length from nose to root of tail ... ... | $5\frac{7}{8}$ | inches |
| „ of tail ... ... ... ... ... | $3\frac{1}{4}$ | „ |
| „ from nose to ear ... ... ... | $1\frac{1}{4}$ | „ |
| „ „ to eye ... ... ... | $1\frac{3}{16}$ | „ |
| „ of ear ... ... ... ... ... | $\frac{9}{16}$ | „ |
| Width of ear ... ... ... ... ... | $\frac{3}{8}$ | „ |
| Length of fore foot and nails ... ... | $\frac{5}{8}$ | „ |
| „ of middle toe nail ... ... ... | $\frac{1}{4}$ | „ |
| „ of hind foot and nails ... ... | $\frac{7}{8}$ | „ |
| „ of middle toe nail ... ... ... | $\frac{1}{8}$ | „ |
| „ of skull... ... ... ... ... | $1\frac{1}{8}$ | „ |
| Width of skull ... ... ... ... ... | $\frac{3}{4}$ | „ |
| Length of nasal bones... ... ... ... | $1\frac{1}{16}$ | „ |
| „ of palatine bones ... ... ... | $1\frac{1}{16}$ | „ |
| „ of lower jaw ... ... ... ... | $1\frac{1}{16}$ | „ |
| „ of upper true molars... ... ... | $\frac{5}{16}$ | „ |
| Circumference of chest ... ... ... | $3\frac{1}{2}$ | „ |

Habitat.—Long Plains, from T. B. Moore, Esq.

We have dedicated this species to T. B. Moore, Esq., Corinna, to whom we are deeply indebted for all the specimens from Long's Plains.

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### Mus Pachyurus—Nov. Sp.

Fur moderately long, rather soft, of a dark dusky brown colour, paler on the under surface, especially at the hinder part, where it is of a greyish brown. Ear of moderate length, rounded, covered internally and externally with short brown hair. Fore feet thickly clothed with long brown hair; hind feet moderately so. Tail thick, sparsely covered with rather stiff, brown hair, through which the coarse scales are freely seen. Whiskers moderately long, and dark. Upper and lower incisors yellow at the tips, and white at the base.

| | | |
|---|---|---|
| Length from tip of nose to root of tail ... | $6\frac{3}{4}$ | inches |
| „ of tail ... ... ... ... ... ... | $4\frac{1}{8}$ | „ |
| „ from nose to ear ... ... ... | $1\frac{3}{8}$ | „ |
| „ from nose to eye ... ... ... | $1\frac{3}{16}$ | „ |
| „ of ear ... ... ... ... ... ... | $\frac{9}{16}$ | „ |
| Width of ear ... ... ... ... ... | $\frac{5}{8}$ | „ |
| Length of fore feet ... ... ... ... | $\frac{1}{2}$ | „ |
| „ of hind feet ... ... ... ... | $1\frac{1}{4}$ | „ |
| Circumference of chest ... ... ... | $4\frac{7}{8}$ | „ |
| Length of skull... ... ... ... ... | $1\frac{9}{16}$ | „ |
| Width of skull ... ... ... ... ... | $\frac{7}{8}$ | „ |
| Length of nasal bones... ... ... ... | $\frac{5}{8}$ | „ |
| „ of palatine bones ... ... ... | $\frac{7}{8}$ | „ |
| „ of lower jaw ... ... ... ... | $1\frac{5}{16}$ | „ |

Coronoid process, curved and acuminate. Condyloid process, small and narrow, nearly horizontal, with a well marked tubercle near its base. Posterior angle broad and rounded. Descending ramus deeply emarginate. Differs from the genus Mus in having its superior and inferior molars almost crossed by folds of enamel (each fold near its termination widens out and has in its centre a deep depression) and in having no cusps. Incisors long and slender.

Habitat.—Long's Plains, from T. B. Moore, Esq.

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### MUS CASTANEUS.—NOV. SP. ♂

Form very robust. Fur very long, dense, and soft; on the head, back, and sides castaneous, interspersed with longer black hairs; on the under surface of the body the hair is of a yellowish ash colour; throat, chin and nose, leaden grey. Fur on the cheeks, excessively long and bushy, giving the appearance of very full whiskers. Ears broad and roundly pointed, covered internally sparsely, and externally thickly with short hairs of the same colour as those on the body. Tail on the upper surface clothed with brown hairs; on the under surface with hairs of a lighter tint, through which the scales can be seen. Fore and hind feet clothed with leaden grey hairs, which reach to the base of the nails. Whiskers moderately long, dark brown, almost black. Form of head rounded. Upper incisors orange colour; lower incisors yellow.

| | | |
|---|---|---|
| Length from tip of nose to root of tail ... | $6\frac{3}{4}$ | inches |
| „ of tail ... ... ... ... ... ... | $4\frac{3}{8}$ | „ |
| „ from nose to ear ... ... ... | $1\frac{1}{4}$ | „ |
| „ „ to eye ... ... ... | $\frac{7}{8}$ | „ |
| „ of ear ... ... ... ... ... ... | $\frac{7}{8}$ | „ |
| Width of ear ... ... ... ... ... | $\frac{3}{4}$ | „ |

| | | |
|---|---|---|
| Length of fore feet and nails... | ... ... | $\frac{1}{8}$ inches. |
| „ of hind feet and nails | ... ... | $1\frac{1}{4}$ „ |
| Circumference of chest | ... ... ... | 6 „ |
| Length of skull... | ... ... ... ... | $1\frac{5}{8}$ „ |
| Width of skull ... | ... ... ... ... | $1\frac{1}{16}$ „ |
| Length of nasal bones... | ... ... ... | $\frac{7}{8}$ „ |
| „ of palatine bones | ... ... ... | $\frac{7}{8}$ „ |
| „ of lower jaw ... | ... ... ... | 1 „ |
| Width of interorbital space ... | ... ... | $\frac{3}{16}$ „ |

Lower jaw very deep; ramus broad. Coronoid process, short and acuminate; condyloid process, narrow and horizontal; descending ramus deeply emarginate; posterior angle broad and rounded. The anterior superior molar has two blunt cusps, a transverse band of enamel, and a posterior cusp. The central and posterior molars have each a transverse band of enamel and two blunt cusps. The inferior molars have transverse folds of enamel, without cusps. Incisors short and stout.

Habitat.—Long's Plains, from T. B. Moore, Esq.

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# NEW SPECIES OF TASMANIAN ANTECHINI AND MUS,

By Edmund T. Higgins, M.R.C.S., Eng., and William F. Petterd, C.M.Z.S.

[*Read 8th May*, 1883.]

## Antechinus Concinnus.

Form slender. Fur moderately soft, brownish-grey on the upper surface, hairs bluish-grey at the base, annulated with pale brown in the middle, and tipped with darker brown; the whole surface interspersed with moderately long black hairs. The fur on the sides and under surface of a pale rusty yellow; the same tint extends round the back of the ear, forming also a narrow line above it. Upper surface of tail clothed with hair of the same colour as the back; under surface pale rusty yellow; the apical portion dusky. Ears very broad and moderately long, clothed internally and externally with yellowish brown hairs. Feet pale rusty yellow. The only specimen we have seen is in the collection of the Royal Society of Tasmania, and somewhat resembles the "minima" of Geoffroy, and may ultimately prove to be only a variety of that species: but the light marks above and behind the ear are so pronounced that we cannot imagine they would have escaped notice if present in Geoffroy's specimen, we have therefore provisionally named it "concinnus."

| | | |
|---|---|---|
| Length from tip of nose to root of tail ... | 4¾ | inches |
| „ of tail ... ... ... ... ... | 3¼ | „ |
| „ from nose to ear ... ... ... | 1⅝ | „ |
| „ from nose to eye ... ... ... | ⅝ | „ |
| „ of ear ... ... ... ... ... | ½ | „ |
| Width of ear ... ... ... ... ... | ⅜ | „ |
| Length of fore foot and claws ... ... | $\frac{7}{16}$ | „ |
| „ of hind foot and claws ... ... | ¾ | „ |

Habitat.—Tasmania. Exact locality unknown.

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### ANTECHINUS MOOREI.—VAR. ASSIMILIS.

Differs from the type, in its smaller size, in the fur of the upper surface being of a reddish brown colour throughout, the hairs annulated with a paler tint, sparsely interspersed with reddish brown hairs. Under surface ashy white. Feet pale reddish brown. Pale line extending from nose to crown of head. The specimen is in the museum of the Royal Society, Hobart. Teeth closely approximating.

| | | |
|---|---|---|
| Length from nose to root of tail ... ... | 5 | inches |
| „ of tail ... ... ... ... ... | 3⅜ | „ |
| „ from nose to ear ... ... ... | 1¼ | „ |
| „ from nose to eye ... ... ... | 1 | „ |
| „ of ear ... ... ... ... ... | ⅜ | „ |

Habitat.—Tasmania. West Coast.

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### MUS TAMARENSIS ♀.—NOV. SPEC.

Fur somewhat coarse, and moderately long, on the upper surface of the body, leaden blue at the base, annulated with yellow in the middle, and dark brown at the tip, thickly interspersed with very dark brown (almost black) hairs, giving the fur a generally mottled yellowish brown appearance; under surface greyish white. Ears rounded, covered internally and externally with short brown hair; a dark patch at the interior portion of the base of ear. Fore feet of moderate size, of the same colour as the under surface of the body. *Hind feet white,* long and slender; toes exceedingly long, and of a pure white colour. Tail, on upper surface, covered with moderately long brown hairs, coarse scales showing freely through; under surface covered with longer greyish white hairs; tip of tail almost black. Whiskers long and fine, composed of dark brown and whitish hairs, some only tipped with white.

| | | |
|---|---|---|
| Length from nose to root of tail ... ... | 6¾ | inches |
| „ of tail ... ... ... ... ... | 6¼ | „ |
| „ from nose to ear ... ... ... | 1⅜ | „ |
| „ from nose to eye ... ... ... | ¾ | „ |
| „ of ear ... ... ... ... ... | ¾ | „ |
| Width of ear ... ... ... ... ... | ½ | „ |

| | | |
|---|---|---|
| Length of fore foot and claws ... ... | $\frac{5}{8}$ | inches. |
| „ of hind foot and claws ... ... | $1\frac{1}{2}$ | „ |
| „ of skull... ... ... ... ... | $1\frac{5}{8}$ | „ |
| Width of skull ... ... ... ... ... | $1\frac{1}{16}$ | „ |
| Length of nasal bones... ... ... ... | $\frac{5}{8}$ | „ |
| „ of palatine bones ... ... ... | $\frac{3}{4}$ | „ |
| „ of lower jaw ... ... ... ... | $1\frac{5}{16}$ | „ |

Habitat.—Streams of Northern Tasmania.

Extremely abundant on the banks of the river Tamar, and probably widely distributed over the island. Settlers residing near the river suffer much from its destructive propensities. Specimens of a very much larger size than the type are occasionally seen.

### MUS LEUCOPUS.

Since the description of "leucopus" was written we have received from Storey's Creek and Long's Plains, and the Royal Society's Museum at Hobart, from the West Coast, specimens of a rat, agreeing in all its essential characters with the type, but differing from it in its much greater size and darker fur. We do not at present feel justified in describing it as a separate species. The type specimen, an adult male, from Kentishbury, measured

| | | |
|---|---|---|
| From tip of nose to root of tail ... ... | $3\frac{3}{4}$ | inches |
| Length of tail ... ... ... ... ... | $3\frac{3}{4}$ | „ |

The specimens from Storey's Creek, Long's Plains, and the West Coast measure

| | | |
|---|---|---|
| From tip of nose to root of tail ... ... | $5\frac{1}{8}$ | inches |
| Length of tail ... ... ... ... ... | $6\frac{1}{4}$ | „ |

## NOTES ON NEW PLANTS INTRODUCED INTO THE ROYAL SOCIETY'S GARDENS DURING 1883,

BY FRANCIS ABBOTT, SUPERINTENDENT.

The following notes on plants, received at the Gardens during the year, have been made with a view to giving increased publicity to this portion of the Society's operations; and also to bring prominently forward any plants of particular merit, either of a useful or ornamental character.

On reviewing the list of introduced plants, I find that there are not many that are likely to become of much utility, yet there are a few which are deserving of notice in this respect, as they are of great commercial importance in their native country.

I would first call attention to the South American Pinus

Australis, which in its native habitat is known as the Georgia Pitch Pine. This tree covers large tracts of country, which are called Pine barrens; it furnishes a superior wood of a very durable nature, suitable for all constructive purposes. Its timber is largely exported, and is known in the trade as the Yellow Pine, or Deal. It also yields, by tapping, large quantities of turpentine, pitch, resin, and tar, large shipments of which are sent to Europe and elsewhere.

The tree is said to be of slow growth during its early stages; this, probably, will account for the slow progress of the seedlings raised at the Gardens, which are not as yet more than a few inches high.

Several species and varieties of American Grapes have been raised from seed; these may eventually prove of some cultural importance in the colony. The first of these I shall refer to is Vitis Labrusea, popularly known as the Northern Fox Grape. The varieties of this grape are largely cultivated in the United States both for wine and table use, but more especially for the latter. This is a hardy grape, frequenting moist ground. It is the largest berried of the American Grapes, and has consequently had more attention devoted to it than the other indigenous species. This has resulted in the production of numerous varieties, many of which are held in high estimation. The Catawba is considered to be the best flavoured of these varieties, but it is very subject to mildew. Ive's is also good, but for general cultivation Concord is considered the best, though somewhat deficient in flavour.

The varieties of Vitis Æstivalis (the Summer Grape) are superior as wine grapes to any other of American origin. Wine made from this grape is held in high estimation on the continent of Europe. The berries are sweet and almost destitute of pulp. The plant requires a warm climate to grow it successfully. The fruit ripens late, but when thoroughly ripe it produces some of the best wine in the country. The plant is very little subject to mildew, which is a consideration of some moment.

Vitis Cordifolia (the Frost Grape) is a small berried sour grape which does not reach perfection till late in the season, or not until frost has set in. It keeps well after gathering, but is generally considered too sour for the production of a good wine. The plant enjoys an immunity from mildew and disease generally, and on this account is valuable for the purpose of hybridising vines of a less healthy nature, as well as for purposes of propagation. The variety Clinton is at present most esteemed for cultivation.

Vitis Vulpina. This is a tender grape requiring a warm situation and rich moist soils; in such it bears abundantly.

It does not appear qualified to produce a good wine by itself, but needs the addition of sugar and alcohol, when it produces an excellent wine; the grape itself imparts a fine bouquet to the product. There are not many of the varieties of this species at present in cultivation; the Scuppernongs are considered to be about the best.

Most of the better class of American Grapes are subject to mildew on the leaves, and consequently are not much cultivated, while those of only second-rate quality, which are of a more hardy constitution, are largely grown both for market and table. Efforts have been made to secure an improved race by crossing with the best varieties of the European vine (Vitis Vinifera), but the progeny are not of a sufficient hardy constitution and quickly die out. On this account the American horticulturists have now turned their attention to the native species, and varieties are yearly being raised, many of which are said to be of superior merit.

Apart from the importance of these vines for the production of fruit or wine, they are in request on the Continent as a stock on which to graft the cultivated varieties of the European vine. The roots of the American vines are not liable to the attack of the much dreaded Phylloxera, by which the vineyards of Europe are at present being devastated. It is hoped that by working on the American vines that this evil will be considerably checked, if not eradicated.

In the ornamental section the introductions have been more numerous, and may eventually add much to the floral beauty of the island. Prominently in this section are the various Rhododendrons, which are invaluable in an ornamental point of view. When this class of plants become better known they will be sure to be more extensively cultivated in the island than they are at present, especially as there are large tracks of country of a peaty or sandy-vegetable nature, occurring naturally, which are eminently suited to their requirements, and where they could inexpensively be grown to an unlimited extent.

In the colder parts of the island the Himalayan species and hybrids would require protection during the winter months.

Of these, Rhododendron Veitchianum is a noble species from Moulmein. It produces large, white, fringed flowers, exhaling a strong perfume. The flowers may be compared to a large fringed vase.

Rhododendron Javanicum is a fine rich orange flowered species from Java. It has been much used in the production of the many beautiful hybrid Rhododendrons brought into notice of late.

Rhododendron Ciliatum is a dwarf early flowering rose and white species from the Himalayas, much prized for early cutting.

Rhododendron Countess of Haddington is a hybrid of great beauty, producing blush-coloured flowers. The following may also be mentioned as hybrids of merit:—Fragrantissimum, Elegantissimum, Prince Leopold, Princess Alice, Princess Helena, Princess Hortense, Princess Royal, Princess of Wales, Denisoni.

The foregoing would in England be classed as greenhouse Rhododendrons, but in this colony they will doubtless prove hardy if planted in warm situations. They are all of very great merit.

In hardy Rhododendrons many varieties have been introduced during the year. So successfully have hybridists been at work of late years that the hardy Rhododendrons have now, many of them, more or less of the Indian type imparted to them, which has much improved the quality of flowers; but in some cases this has been attained at the expense of hardihood. It is well known to the cultivators of Rhododendrons that the greater the affinity to the Himalayan type the less hardy does the variety become. Some of the best in this class of late introduction are:—

James Marshall Brooks, a grand acquisition, producing large trusses of flowers of a rich crimson colour.

Boula de Neige, a beautiful dwarf early free-flowering variety; flowers of the purest white.

Cunningham's White, an extra fine large white flowering variety.

Vesuvius, a fine bright crimson flowered variety.

Ferdinand Louvrex, producing very large trusses of carmine striped flowers.

Madame Linden, a fine masculated variety; quite new.

About a dozen varieties of the hardy Japan Azalea Mollis have been received during 1883. This plant has only recently come into general cultivation. It is superior as an ornamental plant to Azalea Frontica, and will, in time, in all probability, supplant that well known species. It is an early bloomer, and is very valuable for forcing for decorative purposes.

One of the most interesting introductions of the past year is Disa Grandiflora, a magnificent hardy terrestrial Cape Orchid, only found on the summit of the Table Mountain. This Orchid has always been held in repute by cultivators, both on account of its great beauty as well as its hardy constitution; a cool greenhouse, or common frame, being quite sufficient for its successful cultivation.

Many efforts had been made to introduce this Orchid into this colony, but every attempt resulted in failure; the tubers were either quite dead on arrival, or there was so little vitality left in them that they soon perished. These failures having been mentioned to Mr. Tuck, a gentleman from South Africa, who happened to be on a visit to Tasmania last year, and who had brought with him some plants of Disa for Victoria, he promised on his return to the Cape to procure some tubers of the plant and forward to me. In due time I received a small tin box containing sods thickly studded with Disa tubers, which were forwarded by Professor M'Owen, Director of the Botanic Gardens, Cape Town. These tubers have grown freely, and there can now be no longer any doubt of the Disa having been successfully introduced.

The new varieties of fruit introduced during the year have not been so numerous as during previous ones. As a matter of fact the collection of fruit at the Gardens (about 600 varieties) is cramped and starved to such an extent as to defy any attempt at successful cultivation, and the addition of more varieties but complicates the evil.

It is very desirable that a standard collection of fruit should exist in the colony, if only for the purpose of securing correct nomenclature, which is in itself a matter of some importance. The maintaining of such a collection should engage the attention of a Horticultural Society, rather than that of the Royal Society, and did one exist in Tasmania it would be advisable to hand the collection over to it. In the absence of such a Society it becomes a necessity that the present collection at the Gardens be maintained for some time longer.

The mere acquisition of varieties is a matter of secondary importance to that of practically exemplifying the various modes of training and good culture in such a manner as to afford instruction to all desirous of acquiring it. This is indeed the legitimate work of a Horticultural Society, but can only be satisfactorily carried out where a sufficiency of suitable labour is available for the purpose.

As a result of the want of labour at the Gardens, this department has in the past been almost entirely neglected. In its present state it is practically useless, and must, I fear, remain so, unless the Society have placed at its disposal largely increased funds.

In the foregoing notes I have only alluded to some of the more meritorious plants; others of more or less interest might have been included in them, but sufficient has probably been said to show that the past year's introduction are not altogether devoid of merit.

# DESCRIPTION OF A NEW CAVE-INHABITING SPIDER, TOGETHER WITH NOTES ON MAMMALIAN REMAINS FROM A RECENTLY DISCOVERED CAVE IN THE CHUDLEIGH DISTRICT,

BY EDMUND T. HIGGINS, M.R.C.S., ENG., AND WILLIAM F. PETTERD, C.M.Z.S.

[*Read* 10*th July*, 1883.]

## THERIDION TROGLODYTES ♂ & ♀.

*Cave-inhabiting Theridion.*

Cephalo-thorax horny brown, with a longitudinal central depression; sternum ovate, and of the same colour, margined with a few scattered dark hairs, which become darker towards the mandibles. Caput somewhat prominent. Maxillæ large and stout, dark brown, almost black, with a strong incurved hook. Palpi long dark brown. Abdomen ovately elongate, soft, ashy brown, shading to almost black, at the posterior extremity, clothed with short thickly set hair. Legs slender, very tapering towards the claws, of a reddish horny brown colour, becoming darker towards the tarsus, sparsely covered with short black hairs and spines. In a mutilated specimen the legs were of green tint.

Total length from claw of anterior to claw of posterior leg :—♂ $6\frac{1}{2}$ inches. ♀ $5\frac{7}{8}$ inches.

| | | |
|---|---|---|
| Length of anterior leg in male | ...$3\frac{1}{2}$ in. | Female...$3\frac{1}{4}$ in. |
| „ second „ „ | ...$3\frac{3}{16}$ „ | „ ...$2\frac{1}{2}$ „ |
| „ third „ „ | ...$2\frac{1}{2}$ „ | „ ...$2\frac{1}{8}$ „ |
| „ posterior „ „ | ...3 „ | „ ...$2\frac{5}{8}$ „ |
| „ of cephalo-thorax | ... $\frac{3}{8}$ „ | |
| Width „ | ... $\frac{1}{4}$ „ | |
| Length of abdomen ... ... ... ... | | $\frac{7}{16}$ inch |
| Width „ ... ... ... ... | | $\frac{1}{4}$ „ |
| Length of palpi ... ... ... ... ... | | $\frac{5}{8}$ „ |

The specimens were obtained from a recently discovered cave in the Chudleigh district on the property of Mr. Peckitt, who most liberally allowed Mr. Frederick Henry, of Launceston, to select, for our examination, specimens, not only of the Arachnidæ but also of the Mammalian remains deposited in the fissures of the rock and embedded in the earthy floor of the cave. Mr. Henry informs us that the Arachnidæ were by no means plentiful (probably owing to the difficulty of distinguishing them, even with the aid of a brilliant light, in the intense darkness of the cave). The male was found on a stalactite, and the female on her globular nest, which hung from the roof, by a comparatively slender thread. The nest, which was about the size of a pigeon's egg, and contained a large number of young, as well as many unhatched eggs, was formed of a white crystalline web, which scintillated when the light was placed near it, producing a strikingly beautiful effect. The nest was tightly surrounded by the legs of the female. As yet no insects have been found on which the Theridion troglodytes must subsist, but no doubt further and more careful examination will lead to the discovery of many. The cave consists of several chambers, in the innermost of which, where the Arachnidæ were collected, is a large deposit of Mammalian remains, some of which lie on the projecting shelves of rock, to which they are agglutinated by thick stalactitic incrustation; still larger quantities are found in the crevices of the rock, whilst the earthy and stalagmitic floor yields an abundance of the following species, which have been carefully compared with recent specimens:—

Halmaturus Bennettii (brush kangaroo)
Halmaturus Billardieri (wallaby)
Hypsiprymnus Apicalis Potorous Murinus (kangaroo rat)
Bettongia Cuniculus (forester kangaroo rat)
Phascolomys (wombat)
Phalangista Vulpina (black or grey opossum)
Phalangista Cookii (ring-tailed opossum)
Mus Pachyrus (recently obtained from Long's Plains)
Mus Castaneus.

No traces of Carnivorous Marsupialia have been found, but from the enormous number of bones here collected, and from the broken condition of the larger number, it is more than probable that these caves were the resort of flesh-eating Mammals. As the floor of the Bone Cave is about 30ft. below the level of the present entrance, and is only reached by two well-like descents of from 14ft. to 16ft. each, connected by low passages, it is almost certain that an entrance must have existed on the other side of the range. The bones, though not fossilized, for the most part bear evidence of considerable age. In a future paper we hope, after careful examination of the cave, to give fuller particulars of this most interesting discovery, as well as a larger list of the contained organisms. We are informed that the stalactites are truly magnificent, surpassing in beauty those of the well known and justly famed Chudleigh caves.

# NOTICE OF RECENT ADDITIONS TO THE LIST OF TASMANIAN FISHES,

By Robt. M. Johnston, F.L.S., Etc.

[*Read* 13*th August*, 1883.]

## Family—Labridæ.

Body oblong or elongate, covered with cycloid scales. The lateral line extends to the caudal fin, or is interrupted. One dorsal fin with the spinous portion as well developed as the soft; the soft dorsal similar to the anal. Ventral fins thoracic, with one spine and five soft rays. Palate without teeth; only one lower pharyngeal bone without median suture. Branchiostegals, five or six; gills, three and a half; pseudo-branchial and air bladder. Pyloric appendages, none; stomach without cæcal sac.

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### Genus Olistherops (Richardson).

Head entirely naked; scales of moderate size; lateral line continuous; snout of moderate extent; dorsal spines numerous, flexible; teeth as in Odax.

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### Olistherops Brownii.—Nov. Sp.

D. $\frac{18}{10}$; A. $\frac{3}{9}$; L. Lat. 58-60; L. $\frac{7}{14}$.

The height of the body is contained five times and one-fifth in the total length. Caudal fin somewhat lyre-shaped owing to the upper and lower filamentous rays being produced two or three inches beyond the middle series. Like *O. cyanomelas* (Richards.) of the Australian coast, from which perhaps it is doubtfully separable, there is a bluish streak along the upper and lower margins of caudal fin; there are bluish patches on the snout, and the general colour of the body is a dull greenish blue. Caught by Mr. John Brown in the neighbourhood of Table Cape. This is the first representative of the genus recorded from Tasmanian waters. Its nearest ally in Tasmania is the genus Odax, of which "The Stranger" is a member.

The following are the measurements of the specimen examined, and now presented to the Society:—

| | | |
|---|---|---|
| Total length ... ... ... ... ... | 19½ | inches |
| Body ... ... ... ... ... ... | 15⅙ | " |
| Head ... ... ... ... ... ... | 3⅕ | " |
| Snout ... ... ... ... ... ... | 1¼ | " |
| Dia. of eye ... ... ... ... ... | ½ | " |

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## Family Hoplegnathidæ (Bleeker).

—*Gunth. Cat.* III., *p.* 357.

Body compressed and elevated, covered with very small ctenoid scales. Lateral line continuous. The bones of the jaw have a sharp trenchant dentigerous edge, as in Scarus. The teeth, if at all conspicuous, being continuous with the bone, forming a more or less distinct serrature; no teeth on the palate. The spinous portion of the dorsal fin is rather more developed than the soft; the spines strong; anal, with three spines, similarly to the soft dorsal; ventrals thoracic, with one spine and five soft rays.

Australian, Japanese, and Peruvian coasts.

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### GENUS HOPLEGNATHUS (RICHARDSON).

The spinous dorsal with *twelve* spines; the soft dorsal and anal rather elevated; vertical fins somewhat scaly on the basal portion.

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### HOPLEGNATHUS CONWAYII (?) (RICHARDSON).

D. $\frac{11}{12}$; A. $\frac{3}{12}$; P. 18; L. Lat. 96-98.

Height of body contained about two times and a half in the total length; eye large. First spine of dorsal small, situate in a vertical line drawn immediately behind the posterior margin of operculum; second, third, and fourth spines gradually increasing relatively; the fifth, sixth, and seventh nearly equal, being longest; the spinous dorsal occupies the greater portion of the back; the soft dorsal, though containing as many rays, is relatively much shorter; anal developed similarly to the dorsal; colour of body and fins pinkish, mottled with darker spots; sides with four distinct transverse bands, the last situate close to the caudal fin.

Derwent.

| | | |
|---|---|---|
| Total length ... ... ... ... ... | $23\frac{1}{2}$ | inches |
| Body ... ... ... ... ... ... | $21\frac{1}{8}$ | „ |
| Head ... ... ... ... ... ... | $6\frac{3}{4}$ | „ |
| Snout ... ... ... ... ... ... | $2\frac{5}{8}$ | „ |
| Dia. of eye ... ... ... ... ... | $1\frac{1}{2}$ | „ |
| Greatest depth... ... ... ... ... | 9 | „ |
| Least depth at peduncle ... ... ... | $2\frac{3}{8}$ | „ |

I have doubtedly referred this fine fish to Richardson's (H. Conwayii), as it is possible the spines of dorsal are variable.

---

### SALMO FONTINALIS (MITCH).

—*Gunth. Cat.* VI., *p.* 1 52

B. 12; D. 12; A. 10; L. lat. 200; Caec. pyl. 34.

*No median series of teeth along the hyoid bone.* Head of moderate size; cleft of mouth wide; maxillary long, narrow, straight, extending far behind the eye; adult males with the lower jaw prominent; teeth of moderate size; præoperculum short in a longitudinal direction, with the lower limb very indistinct; fins moderately developed; the length of the pectoral is about one-half of the distance of its root from that of the ventral; dorsal as high or higher than long; caudal truncate in adults, lunate in the young; body with numerous pale red spots; fins generally with black and orange (or white) marginal band; dorsal fin with transverse series of brown or black spots. A native of the rivers and lakes of North America.

This species has recently been introduced to Tasmania by the Salmon Commissioners, from New Zealand, where it has been successfully established. It is said to be greatly superior to the English brown trout, and to be equally hardy.

## DESCRIPTION OF A NEW SPECIES OF MUS, WITH A LIST OF THE TERRESTRIAL ANIMALS OF TASMANIA,

By E. T. Higgins, M.R.C.S., Eng., and W. F. Petterd, C.M.Z.S.

[*Read* 10*th September*, 1883.]

### Mus Tetragonurus.—Nov. Spec. ♂

*Quadrangular Tailed Rat.*

Form stout. Head short and broad. Muzzle rounded. Fur very long, soft, dark ashy-grey on the back, annulated with a paler tint, thickly interspersed with longer dark brown, almost black, hair; under surface slatey-grey, lips and chin slatey-grey. Ears short, broadly rounded, clothed sparsely internally, and thickly externally with short hairs of an ashy-grey colour. Whiskers dark brown, of the same length as the head. Fore legs short. Fore and hind feet clothed on the upper surface with ashy-grey hair; under surface naked, dark brown. Tail short quadrangular, sparingly clothed with dark brown hair, through which the scales, which are of moderate size, can be distinctly seen. The young resemble the full grown specimens in colour of fur, and quadrangular shape of tail.

| | | |
|---|---|---|
| Length from tip of nose to root of tail ... | 6 | inches |
| „ of tail ... ... ... ... ... | $3\frac{7}{8}$ | „ |
| „ from nose to eye ... ... ... | $\frac{1}{2}$ | „ |
| „ from nose to ear ... ... ... | $1\frac{5}{16}$ | „ |
| „ of ear ... ... ... ... ... | $\frac{1}{2}$ | „ |
| Width of ear ... ... ... ... ... | $\frac{3}{8}$ | „ |
| Length of fore feet and nails... ... ... | $\frac{7}{16}$ | „ |
| „ of hind feet and nails ... ... | $1\frac{1}{4}$ | „ |

**Habitat of young specimen—Mount Cameron, from Mr. Bell. Habitat of adult specimen—Springfield, from Mr. R. Dyer.** [illegible]

Cynocephalus ;

Sarcophilus ,

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## LIST OF THE TERRESTRIAL ANIMALS OF TASMANIA.

2

### MONOTREMATA.

Ornithorhyncus anatinus ("Platypus"), found also in Victoria, Queensland, and New South Wales, described by Shaw, Nat. Misc., 1799.

Echidna setosa ("Porcupine"), confined to Tasmania. Cuvier, Regne Animal, 1817.

### MARSUPIALIA, OR POUCHED ANIMALS.

Macropus major ("Forester"), found also in New South Wales, Southern and Western Australia. Schreber, Saugeth, 1778.

Halmaturus Bennettii ("Brush Kangaroo"), confined to Tasmania. Waterhouse, Pro. Zool. Soc., 1837.

Halmaturus Billardieri ("Wallaby"), confined to Tasmania, and some of the islands in Bass's Straits. Desmarest, Mammalogia.

Bettongia cuniculus ("Jerboa Kangaroo"), Tasmania. Ogilby, Pro. Zool. Soc., 1838.

Potorous murinus ("Potoroo"), found in Tasmania and New South Wales. White's Journal, 1790.

Potorous rufus ("Red Kangaroo Rat"), Tasmania. Higgins and Petterd, Tr. Roy. Soc., Tasmania, 1883.

Phascolomys Wombat ("Wombat"), common in New South Wales, South Australia, Tasmania, and islands in Bass's Straits. Peron et Lesueur, Voyage aux terres Australes, 1790.

Phalangista vulpina ("Opossum"), inhabits Tasmania, New South Wales, Southern and Western Australia. Shaw, General Zoology, 1800.

Phalangista Cookii ("Ringtailed Opossum"), found in Tasmania, New South Wales, and Southern Australia. Desmarest, Nouv. Dict. d' Hist. Nat., 1817.

Dromicia nana ("The Opossum Mouse"), Tasmania. Desmarest, Nouv. Dict. d' Hist. Nat., 1817.

Belideus sciurus ("The Flying Squirrel"), introduced from New South Wales and Victoria. Shaw, Zool. of New Holland, 1794.

Perameles obesula ("The Bandicoot"), inhabits Tasmania, New South Wales, Southern and Western Australia. Shaw, Naturalists' Miscellany, 1799.

Perameles Gunnii ("Striped Bandicoot"), confined to Tasmania. Gray, Proc. Zool. Society, 1838.

Antechinus Swainsonii. Waterhouse, Mag. Nat. Hist., 1840.

Antechinus minima. Geoffroy, Annales du Museum.

Antechinus albipes, inhabits Tasmania (?), New South Wales, and Southern Australia. Waterhouse, Pro. Zool. Soc., 1842.

Antechinus leucopus. Gray, An. and Mag. Nat. Hist., 1842.

Antechinus Rolandensis. Higgins and Petterd, Tr. Roy. Soc., Tasmania, 1882.

Antechinus leucogenys. Ditto, 1882.

Antechinus niger. Ditto, 1882.

Antechinus concinnus. Ditto, 1883.

Antechinus Moorei. Ditto, 1883.

Antechinus Moorei, var. assimilis. Ditto, 1883.

Dasyurus maculatus ("Tiger Cat"), Tasmania, Victoria, and New South Wales. Shaw's General Zoology, 1800.

Dasyurus viverrinus ("Native Cat"), inhabits Tasmania, New South Wales, and South Australia. Phillip's Voyage to Botany Bay, 1789.

Sarcophilus ursinus (the "Native Devil"), confined to Tasmania. Harris, Proc. Linn. Soc., vol. ix., 1807.

Thylacinus cynocephalus (the "Hyæna"), peculiar to Tasmania. Harris, Pro. Linn. Soc., 1807.

NOTE.—Sarcophilus and Thylacinus, though now confined to Tasmania, at some former period existed in New South Wales, as is evident by their fossil remains found in the caves of Wellington valley, N.S.W.

12

### RODENTIA, OR GNAWING ANIMALS.

Hydromys chrysogaster ("Yellow-bellied Musk Rat"), inhabits Tasmania, South Australia, and New South Wales. Geoffroy, Annales du Museum.

Mussetifer. This and the next species are included in the Fauna of Tasmania, on the authority of the late Mr. Ronald Gunn. Horsfield, Zool., Java.—Gray, Proc. Zool. Soc.

Mussetifer fuscipes. Waterhouse, Zool. of the Beagle.

Mussetifer velutinus. Thomas, An. and Mag. Nat. Hist., 1882.

† Mussetifer griseo-cœruleus. Higgins and Petterd, Pro. Roy. Soc., Tasmania, 1882.

Mussetifer variabilis. Ditto, 1882.

Mussetifer Simsoni. Ditto, 1882.

Mussetifer castaneus. Ditto, 1883.

Mussetifer pachyurus. Ditto, 1883.

Mussetifer tetragonurus. Ditto, 1883. M. Tasmaniensis

Mastacomys fuscus. Thomas, An. and Mag. Nat. Hist., 1882.

‡ Hapalotis penicillatus. Gould, An. and Mag. Nat. Hist., vol. x.

Hapalotis leucopus. Higgins and Petterd, Pr. Roy. Soc., Tasmania, 1882.

The late Mr. Kreft, in his Fauna of Tasmania, mentions a rat under the name of "Tasmaniensis," but without any description, we cannot therefore decide as to the species intended.

† There has been lately received from Mr. R. Helms, of Greymouth, New Zealand, a specimen of the "Native Rat," which he purposes calling "Mus Novœ Zealandiæ," but which, on examination, proves to be identical with the "griseo-cœruleus," described by us in the "Proceedings of the Royal Society of Tasmania for 1882."

‡ H. penicillatus, included by the late Mr. Ronald Gunn in the list of Tasmanian animals, is a native of Port Essington. H. leucopus, described by us in the "Proceedings of the Royal Society for 1882," has probably been mistaken for it.

Forty-two species of Terrestrial Mammalia are recorded as inhabiting Tasmania, of which the following twenty-six are peculiar to the island :—

### Monotremata.

Echidna setosa.

### Marsupialia.

Halmaturus Bennettii
Halmaturus Billardieri
Bettongia cuniculus
Potorous rufus
Dromicia nana
Perameles Gunnii
Antechinus Swainsonii
„ minima
„ leucopus
Antechinus Rolandensis
„ leucogenys
„ Niger
„ concinnus
„ Moorei
„ Moorei, var. assimilis
Sarcophilus ursinus
Thylacinus cynocephalus.

### Rodentia.

Mus velutinus
Mus variabilis
Mus Simsoni
Mus castaneus
Mus pachyrus
Mus tetragonurus
Mastacomys fuscus
Hapalotis leucopus.

## R THE YEAR 1883.

ed to 32° Fahrenheit, and reduced to Mean Sea Level.

| RAIN. | | PREVAILING WINDS. | | CLOUDS. | | |
|---|---|---|---|---|---|---|
| Total Fall. | No. of Days Rain fell. | Direction. | Force. | Amount. | DEW POINT. | PRESSURE OF VAPOUR. |
| ches. | | | (0–12) | (0–10) | ° | |
| 3·60 | 9 | E.S.E. & N.W. | 1·9 | 7·0 | 55·3 | ·438 |
| 2·08 | 14 | E.S.E. & W. | 2·0 | 7·0 | 54·7 | ·428 |
| 3·62 | 14 | S.S.E. & N.W. | 1·7 | 6·4 | 56·5 | ·457 |
| 0·48 | 9 | S. & N.W. | 1·8 | 5·8 | 51·8 | ·385 |
| 1·70 | 12 | S. & N.W. | 1·8 | 6·4 | 44·1 | ·289 |
| 1·61 | 17 | S. & N.W. | 2·6 | 6·9 | 44·9 | ·298 |
| 1·23 | 12 | S. & W.N.W. | 2·1 | 5·7 | 39·8 | ·245 |
| 1·82 | 14 | S. & N.W. | 3·0 | 6·6 | 40·8 | ·255 |
| 1·99 | 11 | S. & N.W. | 2·0 | 6·7 | 42·5 | ·272 |
| 2·65 | 17 | S.S.W. & N.N.W. | 2·4 | 7·0 | 43·4 | ·281 |

ainfall.

| D. | SWAN ISLAND. | | SOUTH BRUNI. | |
|---|---|---|---|---|
| infall. | *Wet Days.* | *Rainfall.* | *Wet Days.* | *Rainfall.* |
| nches. | No. | Inches. | No. | Inches. |
| 1·72 | 10 | 1·15 | 9 | 3·35 |
| 1·66 | 10 | 2·01 | 7 | 3·15 |
| 0·38 | 6 | 0·89 | 13 | 3·45 |
| 0·89 | 3 | 0·52 | 12 | 1·42 |
| 1·20 | 7 | 2·36 | 18 | 4·85 |
| 4·70 | 13 | 3·10 | 15 | 2·22 |
| 3·34 | 7 | 2·35 | 18 | 4·45 |
| 1·89 | 9 | 1·50 | 16 | 3·30 |
| 1·21 | 5 | 3·05 | 14 | 2·73 |
| 2·28 | 11 | 2·91 | 20 | 4·28 |
| 0·58 | 6 | 0·98 | 15 | 4·30 |
| 1·40 | 10 | 1·87 | 23 | 2·81 |
| 21·25 | 97 | 22·69 | 180 | 40·31 |

*ommander* ***J. SHORTT, R.N.,*** **Meteorological Observer.**

# REPORT

OF THE

# ROYAL SOCIETY

OF

# TASMANIA

FOR THE YEAR

1883.

Tasmania:
WILLIAM THOMAS STRUTT, GOVERNMENT PRINTER, HOBART.

1884.

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Webster, A. G., ditto.

ditto.

## *MINUTES of the Annual General Meeting of the* ROYAL SOCIETY OF TASMANIA, *held at the Museum on Tuesday evening, 29th January,* 1884, *the Hon.* DR. AGNEW *in the Chair.* 4

THERE was a numerous attendance of Fellows.

The under-mentioned gentlemen were duly elected Fellows of the Society; viz.—A. B. Biggs, Esq., of Launceston; the Right Rev. Bishop Sandford, D.D.; Albert W. Graham, Esq.; Lieut.-Colonel Legge, R.A.

The Hon. Secretary, Mr. Barnard, read the Report of the Society for the past year; when it was moved by the Chairman, "That the Report be adopted, and printed for circulation among the Fellows." Carried unanimously.

The four retiring Members of Council, and the two Auditors of annual accounts, were duly re-elected.

Mr. Grant had great pleasure in proposing a very hearty vote of thanks to the Honorary Secretary, Mr. Barnard, who had so kindly undertaken the office during the absence of their former Secretary, Dr. Agnew. He felt sure that the Fellows of the Society most cordially welcomed back Dr. Agnew, who had formerly done so very much for the Society, having been the most able and generous Secretary it was possible to be favoured with. At the last Council meeting, being the first at which Dr. Agnew was present since his return home, Mr. Barnard expressed a great anxiety to relinquish the office to the former occupant, who had so well and so worthily filled it, and became thoroughly identified therewith. He felt sure the Fellows would be greatly pleased to hear that Dr. Agnew had re-accepted the position, and after this meeting would again become the Secretary, and his influence and services would doubtless be, as before, of inestimable value thereto. Mr. Barnard had most worthily filled the post during the interval, and the Society owed him a great debt of gratitude for the ability, zeal, and industry he had exhibited in its service, which their great joy at welcoming back Dr. Agnew ought not to make them overlook or diminish. The Society had lost a talented and most faithful representative in their late Curator, who was so highly respected, and whose loss was so sincerely

Domain Committ
Superintendent of the Gardens, had ir
new features in the Domain, and greatly impr
ance as compared with that of two or thre
The labours of Mr. Barnard had been made
and responsible by the decease of their late n
Curator, and also unfortunately by illness, w
him to his house, but from which they would a
see he was recovering, and would unite in the
traces of the illness will soon pass away. For th
many other equally important reasons, he felt s
join in a most hearty and cordial vote of tha
Secretary, Mr. Barnard.

Mr. Stephens said he had very great pleasure
the motion. Though glad to see their old friend
again occupying the position in which he had done
the Royal Society, he was confident that the Fe
fully sensible of what they owed to Mr. Barnard
so readily consented to undertake the duties of
Secretary; and he could himself bear testimony to
painstaking, and efficient manner in which those
been discharged during the past three years.

The Chairman, before putting the motion, begg
few words in its cordial support. During his co
long absence from the Colony he had regular op
through the columns of the *Mercury*, of observi
zealous and efficient manner in which the Honorar
had always conducted the affairs

Mr. Barnard, in acknowledging the vote of thanks, said that he was quite overwhelmed with the kindly feeling so warmly manifested in the recognition of his past services; and that in resigning the position of Honorary Secretary, which he had held for the last three years as *locum tenens* for Dr. Agnew, it was a great satisfaction to him that, in surrendering the office to its proper and legitimate holder, he could do so with the consciousness of having endeavoured to uphold the high reputation which it possessed when he undertook its duties. After some other personal observations, Mr. Barnard referred to the tribute in the Report to the memory of the late Curator as being justly merited, and also spoke of the kind services rendered for the last two months by Mr. Swan. Mr. Barnard concluded by again expressing his grateful acknowledgments for the handsome terms in which the motion had been proposed and supported, as well as for the very cordial reception it had met with from the meeting.

introduced into the Royal Society Gard
by Francis Abbott, Superintendent; "
new cave-inhabiting Spider, together
Mammalian Remains from a recently c
the Chudleigh District," by E. T. Higgin
W. F. Petterd, C.M.Z.S.; Notice of ad
of Tasmanian Fishes, &c., by R. M. J
"Notes on Earthquake Shocks," by Co
R.N.; "Description of a new species of
of the terrestrial Animals of Tasmania," l
M.R.C.S., and W. F. Petterd, C.M.Z.S.
additions to the list of the Fishes of Tasm
Johnston, F.L.S.

In addition to the ordinary scientific pe
donations and exchanges from many f
bodies, especially those from the United St
are constantly accumulating in the library;
become indispensable that a complete c
valuable contents should be undertaken.
has been expended upon binding the pa
serials as they form into volumes, and al
more valuable works in the library, notabl
and Mammals of Australia. Were funds
more might be accomplished with adv
direction.

The usual Meteorological Observations have been regularly received from the Government Observer. There are now eight stations throughout the colony, furnished with first-class instruments, and two additional will soon be opened at King and Swan Islands. Weather telegrams are sent daily to the Melbourne Observatory, whence a forecast of the probable weather for the next 24 hours in Bass' Straits, and on the Northern coast of Tasmania, is daily received and exhibited at the chief Telegraph offices.

## COUNCIL.

No alteration in the Council has taken place during the year, nor have any new candidates been proposed under Rule 31. The provisions of Rule 32 have been duly observed.

## FINANCE.

The increase for the year from all sources has been as follows:—Government grant in aid to Museum, £200; grant to Gardens, £600; annual subscriptions, &c. £177; from Marine Board, £20; sale of plants, &c. at Gardens, £103 19*s*. 10*d*.,—making, with balance from 1882, £1128 5*s*. 11*d*. The expenditure amounted to £1070 18*s*. 3*d*., leaving a balance to credit of £57 7*s*. 8*d*.

A special grant of £100 was made by Parliament for the purchase of additional cases for the Museum, rendered necessary by the increased accommodation required for specimens, of which sum £81 19*s*. 4*d*. has been spent, leaving a balance of £18 0*s*. 8*d*. available for the same object.

## GARDENS.

Many valuable plants have been introduced during the past year, foremost amongst which may be mentioned a collection of ornamental deciduous trees from Messrs. Van Geert, of Ghent, Belgium, comprising maples, beeches, ashes, oaks, elms, and several others of equal merit; and from this source alone some 30 species of forest trees have been added to our collection. Disa grandiflora, a superb terrestrial orchid from the Cape Botanic Gardens, has been successfully introduced.

ons in late

made to Government on the subject; and
is pleasant to report, have at last some reas
further and much needed assistance may be
the current year.

The important work of labelling the plan
in last year's Report, is still being carried on
means will allow.

Thanks are again due to the donors of plan
also to captains and owners of vessels and oth
gratuitously assisted the Society in effecting ex

The approximate number of visitors to the
56,144.

## MUSEUM.

It is with the deepest regret the Council ha
the death of the Curator, Mr. Thomas Roblin.
years Mr. Roblin had been a most faithful,
efficient officer. His quiet, unassuming manne
ness to oblige, and his willingness on all occasio
to enquirers every information in his power,
the respect, esteem, and regard of every
whom he came in

Presentations during the year have been numerous, and of a varied and interesting character. By means of the extra grant already referred to, many alterations have been made, which will secure a much more effective display for the specimens.

For re-labelling and arranging a great part of the Ornithological collection, the best thanks of the Society are due to Mr. E. D. Swan, who has devoted a very great amount of time and trouble to this much needed work. The Society is under additional obligation to Mr. Swan for the valuable services which he has rendered in various other directions during the past two months.

The number (approximate) of visitors to the Museum was:—On Sundays, 11,000; on week days, 13,000. Total, 24,000.

J. W. AGNEW, M.D., *Hon. Secretary.*

## 'T *of the Funds of the* ROYAL SOCIETY OF TASMANIA *for th*

| s. | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| t for 1882.... | .. | | | 27 | 6 | 1 |
| and arrears ............ | 177 | 0 | 0 | | | |
| for clerical ............ | 20 | 0 | 0 | | | |
| | | | | 197 | 0 | 0 |
| sury........ | 200 | 0 | 0 | | | |
| ses ........ | 100 | 0 | 0 | | | |
| | | | | 300 | 0 | 0 |
| ury........ | 600 | 0 | 0 | | | |
| ts, Fruit, &c. | 103 | 19 | 10 | | | |
| | | | | 703 | 19 | 10 |

### Expenditure.

*Royal Society.*
Printing and Advertising..........
Postage, Parcels, &c..............
Collector's Commission ..........
Messenger ......................
Clerical assistance for Meteorological Tables ......................
Library—Books and Stationery ....
Ditto, Bookbinding..............
Furniture, &c. ..................
Sundries ........................

*Museum.*
Salary of Curator ..............
Wages of Museum Attendant ......
Ditto, Sunday duty ............
Insurance ......................
Purchase and preparation of specimens ......................
Water rate......................
Sweeping chimneys ..

£1228 5 11

| | | | | | | |
|---|---|---|---|---|---|---|
| Repair of tools, &c. | 9 | 10 | 10 | | | |
| Freight and carriage of Plants | 14 | 1 | 2 | | | |
| Stationery and stamps | 5 | 2 | 10 | | | |
| Forage | 4 | 7 | 9 | | | |
| Horse hire | 10 | 14 | 0 | | | |
| Ironmongery, fittings, &c. | 54 | 16 | 2 | | | |
| Timber and repair of buildings | 37 | 15 | 10 | | | |
| Seeds | 14 | 8 | 0 | | | |
| Sundries | 26 | 17 | 8 | | | |
| Water rate | 3 | 3 | 4 | | | |
| Flower-pots | 12 | 17 | 0 | | | |
| | | | | 695 | 15 | 1 |
| | | | | £1153 | 7 | 11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Balance as per statement for 1882 | 27 | 6 | 1 | | | |
| Receipts | 1200 | 19 | 10 | | | |
| Expenditure | .. | | | 1153 | 7 | 11 |
| Balance to credit as per pass-book | .. | | | 74 | 18 | 0 |
| | £1228 | 5 | 11 | 1228 | 5 | 11 |

Audited and found correct.

FRANCIS BUTLER.
JOHN MACFARLANE.

*28th January*, 1884.

### IENT of the MORTON ALLPORT *Memorial Fund*, 18

|  | £ | s. | d. | 1883. | Cr. |
|---|---|---|---|---|---|
| ment for 1882…… | 30 | 12 | 10 |  |  |
| ………………… | 13 | 0 | 6 |  |  |
| ………………… | 2 | 4 | 8 |  |  |
|  | £45 | 18 | 0 | Dec. 31. | By balance in Savings Bank Fund ……………… |

**ER,**
**LANE.**

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---

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———————— 66, June, 1883.
———————— 62, February, 1883.
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On the Australian Holey Dollar. By Sir J. H. Lefroy.

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## *LIST of Donors to the Museum during* 1883.

(For particulars of Donations see lists in Monthly Proceedings.)

Adams, R. P.
Barnard, Dr.
Bailey, H. H.
Bastian, C.
Brown, R.
Clerk, A. T.
Crawford, Col.
Crossley, W., jun.
Cotton, J.
Crosby, W., Mrs.
Cowen, J. H.
Chamber of Commerce, Victoria
Davis, Thos.
Davis, R. H.
Edgar, Miss
Elliott, G., Melbourne
Edge, C.
Evans, J. E.
Glover, C.
Geard, Mr.
Hume, Mr.
Hualt, Dr.
Higgins, Dr.
Institute, New Zealand
James, C. W. S.
Knight, W.
Lee, P.
Lamb, Mrs.
Murphy, J. A.
Macpherson, P., Rev.
M'Clymont, J. R.
Minister of Lands, Hobart
Merry, L.
Petterd, W. F.
Page, J.
Rayner, W., New Norfolk
Swan, E. D., Hobart
Stephens, T.
Tucker, F.
Whittaker, J.
Westbrook, G. C.
Woodin, W.
Warner, H. J.
Young, E.

a millefolium rubrum
Androsace sarmentosa
Anemone Caroliniana
Aquilegia leptoceras
Aristolochia sipho
Asplenium Veitchianum
Astragulus thianschanicus
Astrantia Bierbensteini
Bambusa falcata
Barbarea vulgaris variegata
Bignonia gracilis
Calliandra brevicarpa
Calliopsis prolifera
Campanula lamiifolia
Campsidium filicifolium
Carya oliviformis
Carex maxima
Cassia alata
,, hirta
Castanea heterophylla dissecta
Ceanothus olivaricatus
Cerasus—double French
,, Sieboldtu variegata
Cheilanthes Borsigiana
Cinchona Ledgeriana
Cratægus crenulata
Curcuma Leopoldi
Daphne marginata
,, Mazeli
Dasylirion Wheeleri
nium Caucasicum

,,
Fraxinus Ame
Gentiana fatisc
Grevillea Falk
,, ericif
,, obtus
,, junisp
Goniolepis eury
Hedera margina
Hedysarum neg
Helenium autum
Hibiscus lampas
,, splende
Hydranga cyano
Hypœstes purpu
Ilex balearicus
,, cassinoides
Ipomæa pendula
Iris bispinus
,, ensata
,, lævigata
,, nothia
,, virginica
Juglans regia laci
Jurinia eversman
Lactuca Macrorrh
Laurea vespertilio
Liriodendron tuli
,,
gatum
Lygodium

**Polygala triphylla**
Populus Van Geertii
**Potentilla glandulosa**
„ **multifida**
„ **Pennsylvanica**
**Premna,** sps.
**Primula** farinosa
**Pulsatilla** pratensis
„ vernalis
**Quercus** concordia
„ fissus
„ japonica **variegata**
„ macrocarpa
„ macrophylla
„ penduncularis **argentea variegata**
„ elegans **albo-marginata**
„ filicifolia
„ pendula
**Ranunculus lingua**
**Retinospora juniperoides**
**Rhamnus procumbens**
**Rhus rhodanthema**
**Robinia Decaisneana**
**Sapota costata**
**Saxifraga** nivalis
**Scolopendrium cristata**
**Solanum jaquinii**
**Spiraea pallassii**
**Ulmus campestris aureus**
„ „ „ **viridis**
„ „ **urticifolia**
„ **exoniensis pendula**
„ **fulva pendula**
**Urena lobata**
**Uraria Lagopus**
**Veronica Hectori**
„ **Imperialis**
**Wistaria frutescens**

### *Abutilon.*

**Aurea globosa**
Delicatum
Lady of the Lake
Perle d'Or
Princess Marie

### *Caladium.*

Agrippine Dimitri
Countesse de Pogue **Ordan**
Diana
Louise Duplessis
Lepeschkine
Madame A. Warne
„ Houllet
**Madame Humbella**
„ Marjoline Scheffer
Monsieur Linden
Proserpine
Pyrrhus
Walter Scott

### *Clematis.*

Albert Victor
Alexandria
Fair Rosamond
Fairy Queen
Gipsy Queen
Henreyi
J. Gould. Veitch
Lady Boville
„ C. Neville
„ J. Radcliff
„ Londsborough
„ Stratford de **Radcliffe**
Lucy Lemoine
Madame Grange
Marie Lefebvre
Miss Bateman
Mr. J. Bateman
Mrs. Quilter
Purpurea **elegans**
Sensation
Sir Garnett Wolseley
Sir Thomas Moore
**Standishii**
The Queen
Tunbridgensis
Velutina **purpurea**
**Victoria**

Aurora
Constancy
Deutsche Sonne
Herbert Turner
John Ashby
John Greenway
King of Primroses
Louisa Neate

Mrs. Dix
Nellie Buckland
Neville Keynes
Princess of Pruss
Prince Bismark
Princess of Pruss
Queen of Beauties
Rose Unique

### *Lantana.*

Alba magna
Diadem
Imperatrice Eugenie

Meteor
Sanguineum

### *Pelargonium.*

Alexina
Bridal Bouquet
Charles Outrim
Emile Everard
Evening Star
John Bright
Lady Isabelle

Marie Malet
Marie Lemoine
Maggie Hayes
Pygmalion
Thomas Dodds
Ville de Caen
Volante Nationale

### *Pelargonium—Zonal.*

A. F. Barron
Boula Rose
I've got it
La France
Lucy Lemoine
Madame Thibaut
Mrs Laver

Pluton
Princess Stephanie
Renown
Vesuvius, salmon
Vesuvius, white
Wyckærti

Edward Pynært
Elie Moral
Etienne Levet
François Lacharme
Isabella Sprunt
John Bright
Jules Chretien
Lady Sheffield
Little Gem
Madame A. Derreaux
Madame Jeanie Marix
Madame Pulliat
Marie de Blois
Marie Van Houtte
Marquis Ligneris
Mrs. Baker
Mrs. Harry Turner
Monsieur Noman
Oxonian
Panache d'Angers
Perfection de Lyon
Prince Leopold
Royal Standard
Supert et Notting
Village Maid

### *Apples.*

Ailes
American Golden Pippin
Borowisky
Chronicle
Cogswell's
Cooper's Markek
Evening Party
Grimes' Golden Pippin
Hartford Sweet
Irish Peach
Keddleston Pippin
Lady's Sweet
Magnum
Rawles' Janet
Reinette Franche

### *Apricot.*

Late French Red

### *Peach.*

Red Syrian Nectarine

### *Diospyrus Kaki.*

Among
Gosho
Hayakuma
Haycheya
Seedless

## EXCHANGES OF PLANTS, SEEDS, &c. DURING 1883.

From Messrs. Ch. Huber, France—27 packets seeds.

From Messrs. Vilmorin, Andrieux, et Cie., France—5 packets seeds.

From De Smet Frères et Cie., Belgium—2 cases rhododendrons.

From Messrs. A. Van Geert, Belgium—Case deciduous trees.

From Mr. Thos. Gulliver, Queensland—Case orchids.

From Smithsonian Institute, Washington—18 packets seeds.

From Mr. C. F. Creswell, Sydney—Seeds araucaria Bidwilli.

From Baron Ferd. Von Müeller, Government Botanist, Victoria—50 packets seeds.

From Smithsonian Institute, Washington—12 packets seeds.

, et Cie., Paris—5 p

From Mr. G. Brunning, St. Kilda, Victoria—Case pla

From Messrs. J. Smith, Victoria—50 plants.

From Royal Gardens, Kew, England—Seeds Rhus co

From Messrs. C. F. Cresswell & Co., Melbourne—Cas 18 plants.

From Baron Ferd. Von Müeller, Government Botanist 3 packets seeds.

From Dr. J. Hector, Wellington—14 packets seeds.

From Messrs. Shepherd & Co., Sydney—Case containin

From Messrs. Law, Somner, & Co., Melbourne—Case

From Lady Dry, Tasmania—24 packets seeds, Ceylon.

From Messrs. Hugh Low & Co., London—Case plants alive.

From Mr. C. F. Creswell, Victoria—Case containing 3

From Messrs. De Smet Frères, Belgium—320 varieties and anemone.

From Baron Ferd. Von Müeller, Government Botanist, Case Queensland orchids.

From Messrs. J. Smith & Sons, Riddell's Creek, Vi plants.

To Dr. R. Schomburg, Director Botanic Gardens, 2 bags sphagnum moss.

To W. R. Guilfoyle, Director Botanic Gardens, Me 2 bags sphagnum moss.

To Ch. Moore, Director Botanic Gardens, Sydney—2 ba num moss.

To Messrs. De Smet Frères, Ghent, Belgium—32 tre case Norfolk Island pines.

To M. A. Van Geert, Ghent, Belgium—10 tree ferns.

ssrs. Shepherd & Co.

To Botanic Gardens, Cambridge, England—46 packages seeds.
To Botanic Gardens, Calcutta—45 packages seeds.
To Horticultural and Agricultural Society, Madras—70 packages seeds.
To Botanic Gardens, Cape Town—67 packages seeds.
To Botanic Gardens, Natal—53 packages seeds.
To Chamber Agriculture, Washington—74 packages seeds.
To Royal Botanic Gardens, Kew, near London—14 packages seeds.
To T. C. Just, Esq., Calcutta—50 packages seeds.
To Mr. C. F. Creswell, Victoria—Case plants.
To Ch. Moore, Director Botanic Gardens, Sydney, N.S.W.—2 bags sphagnum moss.
To Botanic Gardens, Melbourne—2 bags sphagnum.
To J. Smith & Sons, Riddell's Creek, Victoria—2 bags sphagnum moss.
To Messrs. Law, Somner, & Co., Melbourne—Package seeds.
To M. A. Van Geert, Ghent, Belgium—8 tree ferns.
To Hugh Low & Co., London—Case Norfolk Island pines.

F. ABBOTT, *Superintendent Royal Society's Gardens.*

# PAPERS AND PROCEEDINGS

OF THE

# ROYAL SOCIETY

OF

# TASMANIA,

FOR

# 1884.

TASMANIA:
PRINTED AT THE "MERCURY" STEAM PRESS OFFICE, HOBART.
1885.

THE responsibility of the statements a
given in the following papers and
rests with the individual authors; th
a body merely places them on record.

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# ROYAL SOCIETY.

## APRIL, 1884.

A monthly meeting of the society, the first of the present session, was held at the Museum on Tuesday, April 8. There was a large attendance of Fellows. Mr. Jas. Barnard, V.P., in the chair. Mr. W. J. G. Bedford, M.R.C.S., Eng., and Mr. J. Walch, Hobart, who had previously been nominated by the council, were balloted for, and declared duly elected as fellows of the society.

Mr. Thomas Hughes (England) was introduced as a visitor.

The hon. secretary (Dr. Agnew) brought forward the usual returns, viz. :—

(1.) Number of visitors to Museum, January — On Sundays, 650 ; on week days, 1,384 ; total, 2,034. Do., February—On Sundays, 1,012 ; on week days, 1,494 ; total, 2,506. Do., March—On Sundays, 1,087 ; on week days, 1,181 ; total, 2,268.

(2.) Number of visitors to Gardens—January, total 5,489 ; do., February, 4,898 ; do., March, 5,627.

(3.) Plants, etc., sent from, and received at, Gardens :—

*January.*—Received from Mr. Wm. Bull, new plant merchant, London, patent plant case, containing 100 Chinese chrysanthemums. From Mr. J. Latham, nurseryman, Hobart, collection imported Dutch bulbs, 28 packets. Sent to Major Jacob, Executive Engineer, Jeypore, India, 2lbs. leptospernum lœvigatum.

*February.*—From the Botanic Gardens, Saharampur, N.W. Provinces, India, 50 packets seeds, various. From Baron Ferd. Von Mueller, Government Botanist, Victoria, two packets of seeds. From Mr. G. Oliver, New Plymouth, New Zealand, three packets of seeds. Sent to Mr. G. Brunning, St. Kilda Nurseries, Melbourne, 36 nymphœa alba. To Mr. H. A. James, Department of Mines, Sydney, a bag of sphagnum moss.

*March.* — From the Chamber of Agriculture, Washington, U.S., 60 packets of assorted seed. From Miss J. Owen, Ireland, seven packets of seed. From Mr. H. A. James, Sydney, 13 packets of seed. Sent to Messrs. De Smet Freres, Ghent, Belgium, case Norfolk Island pines.

(4.) The usual monthly and other periodicals for January, February, and March.

(5.) *Meteorological Returns.*

1. From the Government Observer, Capt. Shortt, tables of observations for January, February, and March. 2. From Mr. F. Abbott, Superintendent Botanic Gardens, register of rainfall at Royal Society's Gardens for January, February, and March. 3. From Mr. C. Purdy, Registrar, register of rainfall at Strahan for February.

(6.) Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during January, February, and March, 1884 :— January 4, Verouica augustifolia in full flower ; 6, first ripe apricot (royal) gathered ; 10, Grevillea robusta in full flower ; 12, Jargonelle pear commence ripening ; 22, black mulberries commencing to ripen. February 8, Windsor pear commencing to ripen ; 10, Bon chretien ditto ; 11, green gage plum ditto ; 22, ash, common, commencing to shed seed ; 25, sycamore, common, ditto. March 8, tips of hornbean turning yellow ; 10, seckle pear commencing to ripen ; 12, tips of elm turning yellow ; 15, horse chestnut leaves turning yellow ; 20, ash leaves commence falling—seeds ripe ; 21, oak leaves commence falling—acorns ripe.

and realism.

Haast, New Zealand, the progress o

7. From U.S. Naval Observatory, the total eclipse, J

8. From Field Naturalists' Club, Victoria, the Victor

9. From Mr. R. L. Jack, Queensland, the Governme
on tin mines of Herberton, Western, Thompson's Cree
silver mines of the Dry River, Queensland.

10. From the Linnean Society, Sydney, proceedings

11. From Mr. R. J. Ellery, Victoria, monthly
Observatory.

12. From Mrs. Roblin, Hobart, 26 books, viz., nine vo
1874 to 1882; 10 parts Science Gossip, January t
Daniell's Introduction to Chemical Philosophy, Ellis'
Anatomy, Wilson's Human Anatomy, Dublin Dissector, tw
Zoology, Report of Tasmanian Fisheries.

(8.) *Presentations to the Museum.*

1. From Mr. A. Evans, Richmond, an eagle (Aquila au

2. From Mr. Kermode, Kangaroo Point, four flying
polyommata).

3. From Mr. Blyth, Campbell Town, a magpie (Gymno

4. From Capt. Broom, caterpillars attacked by Sphæri

5. From Mr. J. Swan, Derwentwater, white-fronted
lunulatus).

6. From Mr. J. R. McLymont, a bat (Nyctophilus timori

7. From Mr. J. O. O. McArdell, Mornington, a white h
Novæ Hollandiæ).

8. From Mons. F. Ratte, Sydney, a collection of mineral
ore, from New Caledonia.

9. From Mr. A. Jones, Hobart, a moth.

10. From Mr. G. Browne, two crocodile eggs from Perak,

11. From Mr. Hinsby, a flying squirrel (Belideus sciure
comb, from the Sandwich Islands.

12. From Mr. T. Stephens, a more pork (Podargus cuvier

13. From Mr. Lodge, Sandy Bay, a moth.

14. From Mr. E. D. Swan, two shells (Cypræa argus, Mitr

15. From Mr. R. W. Rollings, a cockatoo
Hollandiæ).

also "Notes on fossils from Maria Island" and "Notes on three species of Tasmanian fish."

### FOSSILS FROM MARIA ISLAND.

Mr. Johnston presented a specimen of Pachydomus globosus, taken from cliffs near Darlington, Maria Island. A diagram was also presented showing the relations of the Pachydomus and Fenestella beds in the 300 to 500ft. of perpendicular rocks facing the sea. The lower series exposed, over 200ft. thick, is almost wholly composed of the large shells of Pachydomus globosus.

The following is a list of the more common fossils found associated with the latter by Mr. Johnston: — Aviculopecten Fittoni, Morris; ditto limæformis, ditto; Spirifera convoluta, Phill.; ditto Darwinii, Morris; ditto Tasmaniensis, ditto; Productus brachythærus, G. Sowerby; Protoretepora ampla, Lonsdale; Fenestella internata, ditto; ditto plebeia, M'Coy; Stenopora informis, Lonsdale; S. Tasmaniensis, ditto; Favosites ovata, ditto; Pleurotomaria Morrisiana, M'Coy.

Scattered here and there are to be found angular blocks of granite quietly embedded in the lower Pachydomus beds. Some of these travelled blocks are estimated to weigh over a ton. It is interesting to speculate how these erratic blocks came to be included in the lower fossiliferous mudstones. The nearest granite formation known in the neighbourhood lies fully five miles to the south. The mudstone series where the granite blocks are found is almost horizontal, and seems to have been little disturbed. The various blocks of granite seen do not appear to be waterworn. By what agency were these huge granite blocks carried to the position in which they are now found? Ice action seems to be most probable, taking all the circumstances into consideration.

Mr. JOHNSTON stated, with reference to the interesting paper contributed by Baron Von Mueller, that had he been aware of the subject of the paper to be discussed that evening he would have brought a copy of the original work for the inspection of the members of the society: a presentation copy, beautifully illustrated, having been recently kindly forwarded to him by the author, Baron Von Ettingshausen, of Vienna. Mr. Johnston stated that this society, and geologists generally, were under great obligation to Baron Von Mueller for the valuable papers he had contributed from time to time towards the elucidation of the Tertiary Flora of Australia. It was a very difficult matter to determine the exact position of vegetable organism from leaf remains only, so far as their exact position in the vegetable kingdom is concerned, and Baron Von Mueller was to be commended for the great care he had bestowed upon such investigations hitherto. Still Baron Von Ettingshausen's distinguished position in this special field of work is a guarantee that even his conclusions, drawn from the close and careful study of the neuration of leaf remains, are worthy of our highest confidence. In any case the figures are especially serviceable in proving the relative position of the various leaf beds found so abundantly throughout this island, and also in many places in Victoria and New South Wales. It is somewhat gratifying to consider that Tasmania contributes fully two-thirds of the materials of which determinations have been made by Baron Von Ettingshausen respecting the Tertiary Flora of Australia.

### FISHES OF TASMANIA.

With respect to the fishes of Tasmania, Mr. JOHNSTON drew the attention of the members to several matters of interest to ichthyologists. As regards the fish recently described by him as the "Butter Fish," and doubtfully referred to the recently described Chilodactylus Mulhalli of Macleay, Mr. Johnston stated that he had since examined a large number of specimens, and found that the individuals varied considerably in the number of simple rays of pectoral and in the soft rays of anal and dorsal fins, and that the prevailing, or type form agreed in every respect with Richardson's C. nigricans hitherto supposed to be confined to King George's rare on account of its infrequent occurrence in the market.

NOTICES AND EXHIBITS.

The hon. secretary exhibited, on behalf of Mr. J. B. Wal
voyage of La Recherche, by La Perouse and Le. Cen. Labill
atlas contained a large collection of plates of various subjec
and 92, and was examined with great interest.

1. On the table a fine collection of nickel ore, fossils,
interesting collection of ethnological specimens from the So
exhibited. (As various articles in this donation presente
peculiar interest, it was agreed that they should be speci
under notice at next meeting with some descriptive observa
donor.)

Mr. R. M. Johnston exhibited a specimen of a fossil shell—
globosus.

Mr. C. H. Grant, in moving a vote of thanks to the au
various interesting papers that had been read, and also to t
presentations, said he felt highly pleased in doing so, and was
Mr. R. M. Johnston among them once again. And in a few c
he referred to the very high and eulogistic terms Mr. Johns
spoken of by such eminent authorities as Baron F. Von Mue
Professor Dr. C. Baron Von Ettingshausen, of the University,

Dr. Agnew cordially seconded the motion, observing this
means the first occasion on which they had to thank their
Baron Von Mueller for his learned and valuable contributions.
gratifying, too, he was sure, to them all to notice by the rema
Von Ettingshausen, how the work of Mr. Johnston was ap
high authorities abroad—work, too, not confined to one bra
Natural History. It was also a matter of congratulation
student in the same field, a native of the colony, and who ha
favourable notice of such an authority as Baron Von Mueller,
be at work among us. He referred to Dr. Barnard, son of
chairman, who he had no doubt would prove a valuable a
frequent contributor to the transactions of the society.

The Chairman returned thanks for the kind mention mad
whose return from England was daily expected. His son had
in some degree won his spurs in the cause of Natural Hi

## JUNE, 1884.

The monthly evening meeting of the Royal Society was held on Monday, June 9, His Honor Mr. Justice Dobson in the chair.

Rev. J. B. W. Woollnough, Mr. A. Park, V.S., and Mr. George Hinsby, Hobart, who had previously been nominated by the council, were balloted for, and declared duly elected as fellows of the society.

Mr. Fiddian, C.S., India, and Mr. Charpentier, England, were introduced as visitors.

The HON. SECRETARY (Dr. Agnew) brought forward the usual returns, viz.:—

1. Number of visitors to the Museum.—April—Sundays, 620; week days, 1,206; total, 1,826. May—Sundays, 1,125; week days, 1,310; total, 2,435.

2. Number of visitors to Gardens.—April, 6,497; May, 5,596.

3. Plants, etc., received, and sent from Gardens.—April — From Mr. W. A. Thompson, Dunedin, one case of ferns; Baron Von Mueller, two bulbous plants, two packets of seeds. Sent to Messrs. Shepherd and Co., Sydney, one bag sphagnum moss.

Plants and seeds received at, and sent from, the Royal Society's Gardens during the month of May, 1884:—

From Mr. G. Brunning, nurseryman, St. Kilda, Victoria, three cases plants.

From Mons. A. Van Geert, Ghent, Belgium, five packets seeds, coniferæ.

From Baron Ferd. Von Mueller, Government Botanist, Victoria, 290 packets seeds, including several Japan coniferæ.

From Chamber of Agriculture, Washington, United States, 75 packets seeds.

From Messrs. Shepherd and Co., nurserymen, etc., Sydney, 14 packets eucalypti.

To Dr. R. Schomburgk, Botanic Gardens, Adelaide, two bags sphagnum moss.

To Messrs. Shepherd and Co., Sydney, two bags sphagnum moss.

To Acclimatisation Society, Brisbane, Queensland, two bags sphagnum moss.

To Mr. John Smith, nurseryman, etc., Riddell's Creek, Victoria, two bags sphagnum moss.

To the Botanic Gardens, Brisbane, Queensland, two bags sphagnum moss.

To Messrs. Brunning and Sons, St. Kilda, Victoria, two bags sphagnum moss.

To Messrs. Law and Somner, nurserymen, etc., Melbourne, two bags sphagnum moss.

To Mr. C. F. Cresswell, St. Kilda, Victoria, box lily bulbs.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during April, 1884: — April 10, common elm leaves commence falling; 12, Coe's fine late red plum ripe; 15, Pyrus ancuparia leaves falling; 16, Chinese chrysanthemum commence to flower; 16, leaves of black mulberry commence to fall; 20, seeds of hornbeam ripe. May 20, first medlar ripe (Nottingham); 25, Photinia serrulata commencing to flower; 27, Ailanthus glandulosa leaves all fallen; 30, Calycanthus prœcox commencing to flower; 31, Jasminum nudiflorum in full flower; 31, Cantua dependens in full flower.

4. The usual monthly and other periodicals for April and May.

5. Meteorological returns from the Government Meteorologist, Hobart; abstract of meteorological observations, Tasmania, for the quarter ending March, 1884; observations for April and May.

List of Additions to the Library for the month of April, 1884:—

Fauna and Flora of New Zealand, Capt. F. W. Hutton.

The Victorian Naturalist, from the Committee V.N.S.

Science, New Zealand.

Journal of the Royal Microscopical Society, from t

Annals de la Societé Royale Malacologique, from the

Seventeen parts Progress Verbal, from the Society.

Societé Royale Malacologique de Belgique, from the

The Twentieth Annual Report of the Canterb Society.

Monthly Notices of the Royal Astronomical Socie London.

Materialism Vindicated by Veni, from the author.

1. Improved facilities for the capture, economic tr tribution of Sea Fishes, and how these matters aff 2. The Fisheries of Ireland. From the Tasmanian sioners.

## MAY.

Report of the Free Public Library, Sydney, for Trustees.

Descriptive Catalogue of Australian Fishes, vol. 1 an ment, by the Hon. W. Macleay, from the Author.

Descriptive Atlas of the Eucalyptus of Australia islands, by Baron F. Von Mueller, from the Author.

Proceedings of the Academy of Natural Science of 3, November and December, 1883, from the Society.

The Midland Medical Miscellany, from the Society.

The Victorian Naturalist, from the Society.

Periodic Law, by J. A. R. Newlands, from the Author.

Two Meteorological Maps, from Meteorological Depart

Geological Survey of India Memoirs, vol. xx., parts 1 Geological Survey Department of India.

Zoological and Acclimatisation Society of Victoria (20 1883, from the Society.

Journal of Science, New Zealand, May, 1884, from the

Catalogue of Birds, vol. IX., from the Trustees British

Monthly Notices of the Royal Astronomical Society, March, 1884, from the Society.

Proceedings of the Linnean Society, Sydney

Phanlogamia

List of presentations to the Museum for the month of April, 1884 :—

### BIRDS.

A cockatoo parrot—Calopsitta novœ-Hollandiæ—Mr. J. Cotton, Riversdale.

Freckled duck—Anas nœvosa—Mr. J. G. Richards, Ross.

### FISHES.

A velvet fish—Holoxenus cutaneus—Mrs. Bradley, Swan Island.

A fish—Macrurus Australis—Mr. Self, Hobart.

### REPTILES.

Three frogs—Lymnodynastes Tasmaniensis—Miss L. Ranclauld.

### FOSSILS.

A fossil bivale, Miss Hall, Huon-road.

### MINERALS.

Specimen of malachite and jasper, Mrs. W. Reilly, Port Cygnet.

Pumice stone, picked up at sea, off the Straits of Sunda, September, 1883, about a month after the eruption, Mr. R. R. Rex, Hobart.

Specimens of pottery (native vessel), pumice stone, and piece of pavement, obtained from the excavations going on at Pompei, on March 12, 1884, Mr. D. Macpherson, New Zealand.

### COINS.

Three Chinese coins, one Melbourne token, Mr. W. Reilly, Port Cygnet.

### ANIMALS.

A skull of rabbit with a curious malformation of the teeth, Mr. J. G. Richards.

## MAY.

### BIRDS.

Two Ceylon hawks—Spilornis spilogaster—from Col. W. V. Legge.

Two chesnut-eared finches—Amadina castanotis—Miss M. A. Dove.

A plover—Lobivanellus lobatus — Mr. J. Whitehead.

Chesnut-faced owl—Strix castanops—Mr. J. G. Richards.

### FISHES.

Two silver bream—Chrysophrys Australis—Mr. W. Reilly.

Three flatheads —Platycephalus bassensis—Mr. W. Reilly.

A rock cod—Pseudophycis barbatus—Mr. W. Reilly.

Young of the lamprey—Geotria Allportii—Mr. Read.

### MOLLUSCA.

A sea hare—Aplysia sp.—Mr. S. P. Baynton.

A star fish, Mr. F. Self.

### FOSSILS.

Cypris Alburyana, Mr. R. M. Johnston, F.L.S., from Geilston.

### MINERALS.

A collection of minerals, chiefly tin ore, from Mount Bischoff, Mr. C. E. Davies.

A model of a penny, Mr. Wara.

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The following papers by Professor R. Tate, F.G.S., F.L.S., etc., Adelaide, were read by the hon. secretary :—

1. “ Notes of a critical examination of the mollusca of the older tertiary of Tasmania, allied to have living representatives.”
2. “ Descriptions of some new fossil mollusca from Table Cape.”
3. “ On the community of species of aquatic pulmonate snails between Australia and Tasmania.”

Mr. R. M. Johnston, F.L.S., read the following papers :—

1. “ Additions to the list of Table Cape fossils, together with further remarks upon certain fossil shells supposed to be identical with living species.”
2. “ Notes on a fossil (Cypris Alburyana), from Geilston.

mmon to the mudst
[illegible] by the boring drill at the Casca
common to the Tasmanite beds on the Mersey.
common to these deposits are the well-known forms
*niensis*, *Spirifera Darwinii*, *Productus brachythy*
*Sanguinolites Etheridgei*, *Pecten Fittoni*, *Pecten s*
*Illawarra*, *Pecten nov. sp.*, *Pleurotomaria Morrisiana*,
*Stenopora Tasmaniensis*, and several others, and the
be greatly increased. If, therefore, it be allowed t
Southern and Eastern coal deposits represent differen
dences from marine organisms, taken by themselve
knowledge, are absolutely valueless, at any rate neutr
examination of the plant remains, associated with
measures, that we have any grounds for separating
groups, as representing different periods. Thus t
remains of the coal measures of the Mersey, which are
the Stony Creek, Anvil Creek, and other coal seams in
are *Glossopteris Browniana* ; equisetaceous stalks, broadl
allied to the Indian genus *Schizoneura* ; a curious orbic
*Actinopteris* ; and numerous impressions of a form closel
*athiopsis media*. On the other hand, the Midland, Sout
coal measures of Tasmania have generally as prevailin
*Australis*, *P. odontopteroides*, *Phyllotheca Hookeri*, *P*
*Sphenopteris alata*, *Zeugophyllites elongatus*, and *Glossop*
therefore, the beds may, without doubt, as already show
Rev. W. B. Clarke, R. Etheridge, junr., and others, be
equivalents of the upper coal measures of New South
from an evolutionist's point of view, Mr. Johnston stat
late Rev. W. B. Clarke, he found it very difficult to rec
stratagraphic, or organic, between the upper and lower
Australia, so far as the marine organisms of undoubt
gave any evidence. If these subdivisions were to be
palæozoic, and the upper coal measures, according to v
as permian, oolitic, dias, or mesozoic, the separation mus
purely one of local convenience. Mr. Johnston observe
the whole, he fully agreed with Mr. Stephens' conclusio
pared to concur with him in regardi
iferous rocks

Southern and Eastern marine beds of Tasmania cover in one unbroken series the whole period represented in Australia and in Northern Tasmania by the lower marine beds, lower coal measures, and upper marine beds; and that the final oscillation of land, producing conditions favourable to the deposits of the upper coal measures of Australia and Tasmania, was the only one which extended as far as the South and East of Tasmania. However, Mr. Johnston was greatly pleased that this matter was being tested, as far as possible in the, North and South, in a practical way by means of the diamond drill, and he hoped to see this most useful practical test still further employed in our important coal basins, not only to measure the value of our coal seams vertically, but also sufficiently extended to ascertain their extent horizontally.

### NOTES AND EXHIBITS.

The hon. secretary exhibited a skull of a rabbit with the incisor teeth of both jaws unusually long, the lower incisors being 1½ inch, upper ones ¾ inch in length. Similar overgrowths have been frequently reported as occuring in all of the rodent family when one or more of the incisors had been lost, but in this case, the abnormal divarication of the lower pair had led to the growth of all four teeth since they could not meet so as to wear each other down.

Colonel Legge exhibited two specimens of the Ceylonese Serpent Eagle, *Spilornis Spilogaster*, Blyth, an adult, and immature bird, and made some remarks on the genus *Spilornis*. The Serpent Eagles formed an interesting section of small, weakfooted, eagles, with an Indo-Malayan distribution, extending from the Himalayas eastwards through Burmah to Formosa, and south-eastwards through Southern India, Ceylon, the Andamans, Sumatra, Java, Borneo, to Celebes, and the Philippines. The section comprised the one genus only, which might be said to be a typical Indo-Malayan form, for it appeared only, in one case, that of the Celebes Serpent Eagle, *S. Rufipectus*, to cross the remarkable dividing line discovered by Wallace, and which passes upwards through the strait between Bali and Lombock, and thence between Borneo and Celebes to the eastward of the Philippines. The fauna and flora to the eastward of this line was Australian in character, and to the westward of it Indian. Apparently, the genus had not yet been found in Papua, but, some day, when that island was perhaps annexed to Australia, our naturalists might discover examples of it. The largest number of the genus *S. Cheela* ranged from the Himalayas to Burmah, and had been found in Formosa. Its smaller representative was *S. Melanotis* of Southern India. In Java, a very similar species to the Ceylonese existed, the *S. Bacha* of Daudin, which is also found in Sumatra. It is darker than the Ceylonese bird, and the edge surrounding the paleoculli of the lower features is scarcely darker than the surrounding colour. Another species is described from the Andamans, by Hume, as smaller than *S. Bacha*. The species ranging further to the eastward are *S. Pallidus* from Borneo, *S. Rufipectus* from Celebes, *S. Sulaensis* from the Sula Islands, and *S. Holospilus* from the Philippines. The habits of the Ceylonese Serpent Eagle were interesting. It was a denizen of gloomy forests, and one or two pairs were always to be found in the magnificent trees surrounding the grand old tanks made by the ancient kings of Ceylon. It sat on a limb overhanging the water, its crest now and then erected, and its brilliant yellow orbs glaring on the water beneath, where it watched for the appearance of some hapless frog or water snake. On the beautiful rivers of the forest regions of Ceylon, which dried up in the hot season, leaving a broad sandy bed with a limpid stream trickling down it, these eagles were also to be found, silently seated on the look-out for their prey. Now and then, in the heat of the day, these birds soared aloft, circling round and round, uttering a loud scream of three long drawn syllables, but, as a rule, they were very silent.

Mr. Morton exhibited some very beautiful photographic views of Lord

brought the matter before the fellows, and referred to th
collection the Australian Museum, Sydney, had in their
said a great deal might be done by our country friends i
the Museum specimens of animals or birds, which, if not
for the Museum collection, would be valuable for excha
museums.

The CHAIRMAN (His Honor Judge Dobson) stated that h
under the notice of the meeting a subject which he was
interest to them all. He alluded to the wanton and
struction of the tree ferns at Mount Wellington. Many
localities on the mountain had been utterly robbed of all
attraction by the stupid destruction of these trees, some o
no doubt represented a growth of fifty to a hundred
sorry to say, too, that this desecration was permitted by
better things might have been expected, and, in very man
mere decoration of a ballroom, trees were cut down which
hope to see replaced in a lifetime. He thought somethin
to stop this senseless waste of beauty, as far at least
Wellington Reserve was concerned, by constituting it
and making it penal to remove ferns or other trees. If G
the initiative in the preservation of the ferns it was prob
private individuals, who may act rather in a spirit of thou
otherwise, might be induced to follow the good example.

After discussion, in which almost all present joined, it w
a committee be appointed in order to bring the views of th
the notice of the Government.

Mr. Justice Dobson, the Mayor (Mr. Belbin), Colonel L
Grant, and the hon. secretary (Dr. Agnew) were appoint
mittee.

A vote of thanks to the authors of papers and donors
closed the proceedings.

JULY 1944

2. Number of visitors to Gardens.—June, 5,010.

3. Plants and seeds received at the Royal Society's Gardens during the month of June, 1884:—

From the Brisbane Botanic Gardens, 18 papers of seeds.

From Mr. J. Smith, Riddle's Creek, Victoria, case containing 46 plants.

From Messrs. Shepherd and Co., Sydney, case containing 60 plants.

From Mr. J. Harris, South Yarra, Victoria, case containing 36 plants.

From the Botanic Gardens, Saparanpur, N.W.P. India, seeds—Picea pindrow.

From Major Jacob, Jeypore, India, seeds—Picea pindrow.

From the Botanic Gardens, Calcutta, collection seeds.

From Baron Ferd. Von Mueller, 12 papers seeds.

4. Plants and seeds sent from the Royal Society's Gardens during the month of June, 1884:—

To Mr. J. Smith, Victoria, plants and seeds.

To Mr. J. Harris, Victoria, seeds.

To Mr. J. Brunning, Victoria, plants and seeds.

To Mr. L. Purchase, Sydney, seeds.

To Messrs. Shepherd and Co., Sydney, seeds.

To Chamber Agriculture, Washington, seeds.

To Messrs. Vilmorin et Cie, Paris, seeds.

To the Royal Gardens, Kew, London, seeds.

To Baron Ferd. Von Mueller, Victoria, seeds.

To C. F. Cresswell, Victoria, seeds.

To Messrs. Heyne and Co., Adelaide, seeds.

To Messrs. Law, Somner, and Co., Victoria, seeds.

To W. R. Guilfoyle, Botanic Gardens, Melbourne, seeds.

To Mr. Wm. Bull, London, seeds.

5. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during June, 1884: — 12th, Maclaura aurantiaca leaves shedding; 20th common privet leaves shedding; 24th, Calcyanthus præcox in full flower; 26th, Crocus vernus in flower; 28th, black mulberry leaves all shed.

6. The usual monthly and other periodicals for June.

7. List of additions to the Library for the month of June:—

Meteorological reports, India, November and December, 1883, from the Meteorological Office, India.

Meteorological observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory, Mr. C. Todd, Government Astronomer.

Monthly weather report of the Meteorological Office, London, for January, 1884, from Meteorological Office, London.

Meteorological report of the Meteorological Council to the Royal Society for the year ending 31st March, 1883, from the Society.

Monthly record of results of observations, etc., by R. L. J. Ellery, F.R.S., Victoria, from the author.

Journal of the Royal Microscopical Society, London (April number), from the Society.

Journal of the Society of Arts (May), (April), from the Society.

Journal of Science (May), from the Society.

Report on the Progress and Condition of the Botanic Gardens and Government Plantations (Adelaide), by R. Schomburgh, F.R.S., and Director, from the author.

Records of the Geological Surveyof India, vol. xvii., part 2, 1884, from the Registrar's Geological Survey Office, India.

Report of the Canadian Observations of the Transit of Venus, December 6, 1882, from the Observatory, Toronto.

Report of the Australian Museum, Sydney, for the year 1883, from the Trustees.

April, from the Society.

Annual report of the American Museum of Nat
from the Trustees.

Agricultural Statistics, Victoria, 1883-84, Vic
ment Statist, Melbourne.

*American Agriculturist*, May, 1884, from Messrs.

Catalogues of the Exhibits in the New South
Exhibition, London, from E. P. Ramsay, F.L.S., e

Census of Victoria, 1881, part 7, occupation
sickness and infirmity, from the Government Statis

Crime in New South Wales, by H. H. Hayter, C.

A Barometer Manual for the Use of Seamen,
Office, London.

Bulletin of the American Museum of Natural
February 13, 1884, from the Trustees.

*The Victorian Naturalist*, May, 1884, from the So

Statistical Register of the Colony of Victoria for t

Blue Book of Victoria, from the Government Stati

Monthly Notices of the Royal Astronomical Societ
1884, from the Society.

Mineral Statistics of Victoria, from the Mines De

Proceedings of the Royal Society, Queensland, vol
the Trustees.

Florist and Pomologist, from the Society.

Nature, from the Society.

8. List of Presentations to the Museum for the mo

BIRDS.

Chesnut-faced owl—Strix castanops, Mr. N. H. Pr

FISHES.

A Blenny—Cristiceps Australis, Mr. W. Boyes.

MOLLUSCA.

Soft mollusks—Philine aperta, Mr. W. Boyes.

A land shell — Bulimus sp., from New Zealand,

ECHINODERMATA.

Two sea eggs—Salmacis sp. (?), Mr. J. McCance.

A sea urchin—Maretia sp., Mr. W.

### MINERALS.

Specimen of fossil wood, Miss Buckland.

The following papers by Professor R. Tate, F.G.S., F.L,S., etc., Adelaide, were read by Mr. R. M. Johnston, F.L.S.:—

1. Description of new species of mollusca of the upper eocene beds at Table Cape.

2. Notes and description on a new species of Odax, by R. M. Johnston, F.L.S., etc.

3. Description of a new fossil shell, from the Eocene Beds, Table Cape, by R. M. Johnston, F.L.S., etc.

### NOTES AND EXHIBITS.

Colonel LEGGE presented two specimens of birds to the Society—one an owl (the brown fish owl, *Ketupa Ceylonensis*), and the other a kite (the Indian pariah kite, *Milvus govinda.)* He would not advocate the acquisition of birds from all parts of the world for this necessary adjunct, but thought that a complete collection from the ornithological region, embracing India and the Malayan Archipelago, and terminating in New Guinea, would be valuable here for comparison. There were three species of this large owl—one inhabiting Ceylon; another coming from the Malayan Archipelago; and the third from the Himalays and China. Curiously enough, no large owls were found in Australia, excepting a variety of the barn owl known in England. The present specimen was brought from the jungles of Ceylon. The species lives chiefly on fish, but also on vermin of different kinds and small birds. It is a very ravenous bird, and forms rather a formidable looking object when seen in the gloom of the forest. The specimen under notice was a female. The kite shown was found chiefly in Ceylon and India. It was allied to our Australian kite *(Milvus affinis)* found along the eastern coast and up as far as Timor, the Malayan Archipelago, and extending to the Andaman Isles and to India. There were two allied species of this kite—*Milvus govinda*, to which the present specimen belonged, and *Milvus affinis*. *Milvus govinda* ran up to 19in. in breadth of wings, whilst the Australian kite was never larger than 16½in. The Australian kite, of which there was no specimen at present in the Museum, was darker than the other, and showed an unmistakable difference. It was curious that no species of kite was found in Tasmania; that, though it was found in Victoria, South Australia, and Western Australia, it had not crossed the Straits. The bird was well known in India, where it frequently flew about the streets, and attacked boys carrying provisions: it was also a great attendant in the fishing nets in the morning. He would like to see a specimen of the *Milvus affinis* found in this country. While speaking of birds, he would throw out a suggestion to members fond of ornithology, viz., that a specimen of the osprey was wanted for the Museum. He knew that the bird was found on the eastern coast of Australia. The common fish-hawk or grey back sea eagle *(Haliœtus leucogaster)*, was also wanted. It was found in the Himalayas, and extended down to this country, where specimens were supposed to be larger than elsewhere. (Applause.)

Mr. STEPHENS directed attention to an interesting rock specimen from the Upper Huon district, discovered and presented to the Museum by Mr. Clarles Glover, who was well known as the pioneer in mineral explorations in the South-west, and whose labours in that field for many years past had rivalled those of Mr. James Smith in the North, though they had not resulted in the discovery of another Mount Bischoff. This rock had attracted much notice, and, until carefully examined, had led many persons to suppose that it was allied to the well known Carrara marble. Mr. F. M. Krausé, of Ballarat, had kindly analysed a specimen of the rock, and furnished the following description:—Rock specimen from Weld River, Upper Huon.

Mr. Krausé had also furnished the following note on a spe altered sandstone at Campania, which was sometimes mistaken reef. Ferrugineus quartzite (so called "auriferous sandstone") No trace of gold.

There was no reason to doubt, he (Mr. Stephens) thoug specimen from the Weld River was from an altered ro those described by Strzelecki under the general term of sili the outcrops of which might be seen at various points on the to the West of the River Leven. If more accessible, it might utilised in the manufacture of the finer kinds of pottery, but h the remoteness of its situation would prevent it from being t profitable account.

Mr. C. H. **GRANT** believed that the rock under notice was t decomposition of granite in some form or other. It was no d freed from its mica, and probably altered by electrical actio not be found in any quantity. It was nodular in its characte

Mr. **STEPHENS** did not think that the rock was at all nodula spoken of by Mr. Grant. It might be described as a massive stratified with bands of quartzite and other altered rocks, an had traced it for a mile in the direction of its strike.

The **CHAIRMAN** intimated that Mr. W. H. Charpentier had sented to become honorary draughtsman to the Society.

Mr. **CHARPENTIER** presented a cabinet of zoophytes, which, he form the nucleus of a fine collection if any of the members desi the study, which was a favourite one in Victoria and the other great many specimens could be found on the Tasmanian co were only three varieties missing from the collection to mak and it included a great number of *Diatomaceæ*. There wa he would like to mention, though he did it with diffidenc chester microscopical societies were formed in connection institutions as this, and worked with a great amount By the aid of the microscope they were not only able to deal more of fossils, etc., but sections of rocks were made for Any gentleman desiring to take up the study could provide hi microscope similar to that on the table (one of Field's), for

Mr. **Charpentier** added that in Manchester the artisans had been foremost in scientific research, and their studies had done a vast amount of good.

The **Chairman**, on behalf of the Society, thanked Mr. Charpentier for his donations to the Museum.

Mr. J. **Swan** proposed a vote of thanks to the donors and authors of the various papers read before the meeting.

Several members examined the zoophytes shown by Mr. Charpentier by means of the microscope, and the meeting closed.

## AUGUST, 1884.

The monthly meeting of the Royal Society of Tasmania was held on Monday evening, 11th August. Mr. James Barnard, V. P., occupied the chair. Mr. J. McAlpin, F.L.S., Edinburgh, was introduced as a visitor. A very large number of Fellows were present.

The following were duly elected as Fellows of the Society:—Miss Mary Lodder, the Hon. John Lord, M.L.C., Rev. John Vansittart Buckland, B.A., Messrs. Crawford John Maxwell, J. R. McClymont, M.A., W. Saville Kent, F.L.S., F.G.S., etc., W. Harvey Buckland, B.A., H. C. Kingsmill, B.A., J. McCance, F.R.A.S., R. Sydney Milles, C.E., Chas. Ellis Davies, J. G. Davies, Philip Seager, Henry Cook, jun., T. C. Just, W. H. Charpentier, Frederick Pedder, Alex. North.

The **Hon. Secretary** (Dr. Agnew) stated that the society was to be congratulated on the election of such a large number of Fellows, a far greater number than had hitherto been elected in one evening.

### RETURNS, ETC.

The **Hon. Secretary** brought forward the usual returns, viz.:—

1. Number of visitors to the Museum:—July—Week days, 1,289; Sundays, 870; total, 2,159.
2. Number of visitors to Gardens—4,999.

3 and 4. Plants and seeds received at and sent from the Royal Society's Gardens during the month of July:—

From Mr. Joseph Harris, South Yarra, bundle of fruit trees, etc. (30).
From Messrs. Law, Somner, Melbourne—Case, containing 74 plants.
From Mrs. S. Purchase, Parramatta—Case, containing 30 plants.
From the Botanic Gardens, Brisbane—Case, containing 15 ferns.
From Messrs. Heyne Co., Adelaide—31 packets seeds.
From the Colonial Museum, Wellington—17 packets seeds.
To the Botanic Gardens, Rome—36 packets seeds.
To Mr. Joseph Harris, South Yarra—Case seedling plants.
To Messrs. Law, Somner, Melbourne—Box seedling plants.
To Mr. C. F. Creswell, Melbourne—Box seedling plants.

5. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during the month of July:—

15th. Paper almond commencing to flower.
18th. Cytisus leucanthus commencing to flower.
25th. Winter aconite commencing to flower.
25th. Arbutus unedo commencing to flower.

[illegible]

existing coral closely allied to the Pal
(2) On the Madreporaria, or Stony Corals.
(3) On a new genus of the Madreporaria, or Sto
(4) Hackel, on the relationship of the sponges t
(5) On a new species of Sagitta from the S. Paci
(6) Notes on the Embryology of Sponges.
(7) Observations upon Prof. E. Haeckel's Grou
and on the affinity of the Sponges.
(8) The Foraminiferal nature of Haliphysema Tu
(9) On the Hexactinellidœ or Hexradiate Spicule
(10) Notes on Prof. J. Clark's Flagellate Infusoria,
new species
(11) On a new Anchoring Sponge "Dorvillia Agar
(12) On the Calcareous Spicula of the Gorgonaceæ.
(13) On some new and little known species of M
Corals, in the British Museum collection.
(14) Report upon the sponges of the Bahama Island
(15) A further communication upon certain Gig
recently encountered off the coast of Newfou
(16) On two new Genera of Alcyonoid Corals.
(17) Notes on Appendicularia and the Larval
Acanthocephaloid Scolecid from the coast of
(18) On a new genus of Sponges from North Austral
(19) On a new British Nudibranch (Embletonia Gray
(20) British marine and fresh water fishes.
(21) Infusoria: What are they? Their collection ar
(22) A Manual of the Infusoria, pts. 1, 2, 3, 4, 5, (
8. Transactions of the Asiatic Society of Japan, vol
Society.
9. The Victorian Naturalist, vol. 1, No. 6 (June), f
10. Transactions of the Royal Historical Society,
the Society.
11. Monthly Notices of the Royal Astronomical So
7 (May), from the Society.
12. On the Bingera Meteorite, New South Wales.
13. Rocks from New Britain and New Irel
14. On the Chemical

21. Meteorological Observations, India (January), from the Meteorological Office, India.
22. *Agricultural Gazette*, June 9th, 16th, 23rd, 30th.
23. *Gardeners' Chronicle.*
24. The *Athenæum* (June).
25. The *Nature* (June).
26. Journal of Science (July).
27. Annals and Magazines of Natural History.
23. Journal of the Society of Arts (May and June).
29. The *Florist and Pomologist* (July).
30. Census of Victoria, from the Victorian Government.
31. Vital and Meteorological Statistics of Tasmania, from the Government Statistician.

### MUSEUM.

List of Presentations to the Museum :—

#### Mammals :

A Tasmanian Tiger—(Thylacinus cynocephalus), Mr. Dunbabin.
Two Native Cats—Dasyurus viverrinus, Mr. C. E. Davies.

#### Birds :

Chestnut-faced Owl—Strix castanops, Mr. F. Weston.
Collared Sparrow Hawk—Accipiter torquatus, Mr. Geo. Howe.
Head and Feet of Wedge-tailed Eagle—Aquila audax, Mr. H. Gatty.

#### Fishes :

A Tasmanian Red Perch—Anthias rasor, Mr. Boyes.

#### Reptiles :

A Diamond Snake—Hoplocephalus superbus, Mr. W. F. Petterd.

#### Mollusca :

A Pecten—Pecten fumatus—Mactra cretacea, Mr. E. D. Swan.
A Mussel—Mytilus, sp., Mr. W. Saville-Kent.

#### Fossils :

Fossil Wood, Mrs. Justin McC. Browne.
Fossil Shells, Mr. C. E. Davies.

#### Ethnology :

Bows and Arrows, etc., from the Andaman Islands, presented by Mr. T. C. Just.
A Water Colour Painting of Tasmanian Fish, Mrs. L. Meredith.

### FERNS ON THE MOUNTAIN.

The Hon. Secretary said the Fellows would recollect that the destruction of the ferns at the Bower had been brought under the notice of the last meeting by Mr. Justice Dobson ; and, as a result, a deputation consisting of himself, Colonel Legge, and Mr. C. H. Grant, had waited on the Minister for Lands to make representations to him on the subject. A few days afterwards he received a reply from the hon. gentleman saying that he (the Minister of Lands) entered heartily into the matter, and would do all that lay in his power to carry out the objects of the deputation. Arrangements were being made to define the boundaries of the private property in the locality, and, as soon as this was done, boards would be erected warning people not to cut ferns on the Crown land, and the bailiff would be instructed to see that the notices were respected.

### THE DEATH RATE.

Mr. R. M. Johnston, F.L.S., read a paper entitled—" Remarks on the observed periodicity of the death-rate, with suggestions as to its wave. Altho states of Europe do not correspond with each other so c widely separated colonies of Australia it is considered sig mean of the death-rate of Europe corresponds in a rema that of Australasia. Mr. Johnston considers that the gr of the Australasian colonies is due more or less to artificial evils, such as pestilence of war and exces population, and therefore it is conceivable that the d Australasian colonies is a more reliable index of immediate effect of super-terrestrial causes. The paper with diagrams.

### CANCER IN CATTLE.

Dr. H. A. Perkins, M.D., read a paper on *Osteosarco* cancer of the jaw in cattle; and added that since writi had found that there had not been an undue number cancer in man during the last few years, but only in a degree to the increase of population. Accompanying specimens of tumorous bones illustrated by comparison of healthy animals taken from similar parts, which in r cancer at all, but a growth of scrofulous or tuberculosi paper was accompanied with a post mortem report of t of 12 beasts, suffering from the disease, made by Mr. Pa

The Acting Chief Justice (Hon. W. L. Dobson): Ca lutely destroy tuberculosis?

Dr. Perkins: In many cases only by destroying the e

The Acting Chief Justice: Would there be no har after it was well cooked?

Dr. Perkins: That would depend upon how it roasted, and on the extent of ravages of the disease. M meat into the water before it is boiling, and let it, as it for a time, and so make a decoction. The better plan i the water has reached boiling point before placing the

Mr. Belstead: For the purpose of destroying the

Dr. Perkins: Partly so, and partly for ordinary cool well. At the same time it was true that the disease m in the parts contiguous to the water.

The **Hon. Secretary** said these cases, though commonly said to be cancerous in character, were in fact truly tuberculosi; cancer was a complete misnomer.

Mr. **Swan**: Until lately he had always heard the term cancer applied to the disease.

The **Acting Chief Justice** said in reference to a remark in the paper about rabbits not drinking, he had often, when out shooting, seen rabbits come down in the evening to drink at a water hole.

Dr. **Perkins**: In very dry weather?

The **Acting Chief Justice**: Yes.

Dr. **Perkins**: There was no succulent food about for them.

Mr. **Swan** said the disease was as common amongst kangaroos as cattle.

Dr. **Perkins**: In Germany 20 per cent. of the cattle suffered in that way.

Mr. **Belstead**: We may consider ourselves well off, then.

### OTHER PAPERS.

The following papers were also read :—

Notes on a Sapphirina and a Salpa, caught off the Cape of Good Hope. By John McCance, F.R.A.S. Accompanying the above paper were two beautiful drawings of the above specimens.

Notes on the discovery of two rare species of Ferns, new to Tasmania. By R. M. Johnston, F.L.S., etc.

Description of a new species of Crepidula, from the Eocene beds, Table Cape. By R. M. Johnston, F.L.S., etc.

### NOTES AND EXHIBITS.

Mr. **Stephens** called attention to three specimens placed on the table for inspection.

1. Core of Silurian limestone from the diamond drill at Tarleton, proving, he regretted to say, the correctness of his previous remarks in regard to the position of the Mersey coal measures. The search for coal at that particular spot was therefore at an end.

2. A specimen of *Orthoceras* s.p. from the Silurian limestone near Redwater Creek, Mersey, forwarded by Mr. Hainsworth. A portion had been sent to Mr. Wilkinson, Government Geologist, Sydney, for comparison with similar fossils from New South Wales, but it had not yet been identified.

3. Part of small boulder with casts of *Orthis* and crinoidal stems, etc. This, as he had ascertained from information kindly furnished by Mr. Thureau, was found in sinking a shaft near Lisle at a depth of 30 feet, and was interesting in connection with the Silurian fossils found under somewhat similar conditions near Table Cape. Perhaps some day they might trace it back to the parent rock from which it was broken off.

Mr. **R. M. Johnston** stated that, with regard to the results of boring at Latrobe, although unfortunate as regards the prospects for coal, the discovery that the lower coal measures of that district rested immediately upon the silurian limestone was of particular interest to him, inasmuch as the position of the Tasmanite beds could now be more satisfactorily determined. When he (Mr. Johnston) examined the Tasmanite beds some years ago, he found waterworn fragments of the silurian limestone included among them. Recently he discerned in the lower portion of the core from the Mersey boring-rod a dark close-grained sandstone identical in character with certain bands occurring in the Tasmanite series, and he therefore had every reason to believe that the latter and their equivalents formed the lower members of the Mersey coal measures.

establishment mad
for which town probably the initial L stan

Mr. BROWNE stated that the Hentys had no
whaled from the shore at Portland Bay, after som
all their whaling plant which was bought by owners
some of these vessels are known to have fishe
Hemisphere, where the whale was probably struck
the harpoon.

**Mr. STEPHENS said he had drawn the attentio
Müeller to a beautiful light purple fungus which had
slopes of Mount Wellington. The fungus being too f
town, a drawing made by Miss Walker, of Rhodes,
forwarded to the Baron, who had identified it as a s
and had since sent the following note on the subje
drawing to the great specialist, Dr. Cooke, pointing o
was near *Clavaria Amethystina*, but differed somewh
suggested the name *C. lilarina*. He, however, regar
species of Fries. It is new to Tasmania, indeed to Au
it is worthy of notice at your Royal Society, if it was
fungi need yet much to be studied there."**

### THE CALCUTTA EXHIBITION.

**Mr. JUST said he had presented the Society with a c
logical specimens, consisting of bows and arrows, dr
ments worn and used by the natives of the Andaman I
had been fortunate in obtaining through the instrume
Portman, assistant superintendent at the Andaman and
While the exhibition was going on the Government of
to have casts taken of some of the native races and wil
representatives of which were present in Calcutta at t
plied for duplicates of some of the casts before he left,
secretary would follow up his action there would be
obtaining the casts, and Dr. Watt, the curator of
Museum in Calcutta would take care that proper d
plied for them. The Lieut.-Governor of Bengal had
promising him a complete set of the economic produc
other interesting specimens whi
society for**

### VOTE OF THANKS.

Mr. J. McC. Browne moved a vote of thanks to the donors of the various presentations, and the gentlemen who had contributed papers; and said he had it as the opinion of a person in Melbourne, who was used to cattle generally, that the so-called cancer was not prejudicial to human life and health, nor was it regarded with so much apprehension as pleuro-pneumonia.

The Acting Chief Justice seconded the motion, for the purpose of saying that the Minister of Lands was entitled to some recognition from the society for the promptness with which he had shown his regard for the opinion of the society, as to what should be done for the preservation of ferns on the mountain. One remark he wished to add was that in Hobart they had two great advantages, the mountain and the river—the mountain on the one side, which they could enjoy at will, and the river on the other, which they could enjoy also, but which they could not enter to have a bath without paying for it. It seemed to him as if it was throwing away one of the greatest advantages which nature had given them. He saw the Minister was in favour of granting a new boating club a site for a shed, and he trusted the hon. gentleman would add to that another shed or hoarding, so that a swim or a wash could be had at any time free of charge, as the possession of such an advantage would be the means of adding to the health and manliness of the rising generation.

The motion was carried by acclamation, and the proceedings terminated.

## SEPTEMBER, 1884.

The monthly meeting of the Royal Society of Tasmania was held on Monday evening, September 8. His Honor, the Acting Chief Justice, Mr. Justice Dobson, F.L.S., occupied the chair. There was an unusually large attendance of Fellows and visitors, the latter, including about 20 ladies, the Premier (the Hon. Adye Douglas), the Minister of Lands the (Hon. N. J. Brown), and other prominent gentlemen.

The following gentlemen having been previously nominated by the council, were duly elected as Fellows of the Society:—Rev. Geo. Clarke, Messrs. T. R. Atkinson, Leonard Rodway, P. Oakley Fysh, jun., Alfred Mault, Geo. P. Fitzgerald, W. P. Little, W. L. Boyes.

### Returns, Etc.

The Hon. Secretary brought forward the usual returns, viz.:—

1. Number of visitors to the Museum.—August—Week days, 1,140; Sundays, 1,065. Total, 2,205.

2. Number of visitors to Gardens, 4,851.

3. Plants and seeds received at the Royal Society's Gardens during the month of August.

From the Botanic Gardens, Wellington, N.Z., 17 packets seed.

From Messrs. Heyne, Adelaide, 36 packets seeds.

From Baron Ferd. Von. Mueller, Victoria, roots Nymphœa Gigantea, etc.

From the Botanic Gardens, Rome (Lady Dry), 46 packets seeds.

From Mr. James Grant, Queensland, 18 packets seeds.

From Mr. J. Smith, Riddell's Creek, Victoria, 20 plants.

From the Botanic Gardens, Melbourne, 39 plants, 30 packets seeds.

4. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during August, 1884.

gical Report, 1883, inc

—New Zealand Meteorological Observatio
M.D.C.M.G.

Melbourne monthly record Meteorological Ol
Government Astronomer.

Statistical Register of the colony of Victoria
ii. (Population). From the Government Statis

Results of Rain and River Observations made
by H. C. Russell, from the author.

New South Wales Physical Geography and Clim
B.A., from the author.

The Victorian Naturalist, July, from the Society

Tasmanian Statutes, Vols. 1 and 2.

Tasmanian House of Assembly Journals, Vol
Government Printer.

Tasmanian House of Assembly Papers, from Mr.

The *Gardeners' Chronicle.*

The *Agriculturist.*

The *American Agriculturist.*

The History of Tasmania, by J. Fenton.

An illustrated introduction to Lamarck's Concho
by the author, E. A. Crouch, F.L.S.

Proceedings of the Linnean Society of New S
IX., part 2nd, August, 1884, from the Society.

### Catalogues.

Dulau and Co.'s catalogue of French books.

Dulau and Co.'s catalogue of medical works.

Dulau and Co.'s catalogue of botanical works.

Dulau and Co.'s Tourists' Guide Book.

Bibliotheca Geographica et Historia.

Catalogue of the library of the late Hon. John Mac

### Museum.

List of presentations to the Museum :—

### Mammals.

A Tasmanian Tiger, Thyl

1 Ephthianura albifrons.
1 Meliornis novœ-hollandiæ.
1 Selby's Thrush, Colluricincla Selbii, by Mr. H. L. Swift.
1 Firetail Finch, Estrelda bellus.
1 Striated Calamanthus, Calamanthus fuliginosus.
1 Yellow-throated honeyeater, Ptilotis flavigula.
1 Dusky Robin, Petroica fusca.
1 Pink breasted Robin, Erythrodryas rhodinogaster.
1 Flame breasted Robin, Petrœca phœnicea.
1 Blackcapped honeyeater, melithreptus melanocephalus, by Mr. F. P. Wilson.
A collection of Tasmanian Birds' Nests, Mr. J. R. McClymont, M.A.

### Mollusca.

Tasmanian Shells, Mr. E. D. Swan.

### Ethnology.

A Fijian Native Basket, Mr. E. D. Swan.

## SUBMARINE CABLES.

The HON. SECRETARY (Hon. Dr. Agnew) announced that Mr. Robt. Henry, jun., Superintendent of Telegraphs in Tasmania, had promised to deliver a lecture on "Submarine Cables," giving a practical illustration of the means by which the localities of breaks or faults in the cable are determined.

Mr. HENRY prefaced his remarks by describing the manner in which cables are constructed and the materials and process used to ensure complete insulation, not forgetting the spiral covering of brass which is sometimes necessary in Indian seas to protect the cable from the ravages of a specie of Teredo, which bore through the gutta-percha covering till the copper case is reached, then destroying the insulation. To illustrate his remarks on the preservation of cables, he exhibited a small section of cable cut from the break which recently occurred between Tasmania and Victoria, about 70 miles from Low Head. The present cable had been down about 15 years, and this was about the only serious break that had occurred. There had been one or two breaks previously, but they had been nearer the shore, and the causes had been apparent. At the Victorian end a reef of rock ran across the cable, and could not be avoided, and the result was that in time the cable was fretted away by the continual action of the waves. About five years ago, however, a heavier cable had been laid at the shore ends, and no trouble from that quarter had arisen since. The lecturer then proceeded to explain the different conducting properties and resisting powers of the various metals, and showed a small coil of German silver—a very bad conductor—which had a resistance equal to 50 miles of cable. He entered at length into a description of the means by which a current of electricity may be used to measure lengths of wire. There were two units of measurements, called "ohms," in general use; one, the "British Association unit," might be roughly represented by a mile of copper wire about one-quarter of an inch in diameter, and the other, "Siemen's unit," represented by a column of pure mercury about forty inches in length and 1-40th of an inch in diameter. The "ohm" must be understood to represent a standard of comparison, in the same manner as an inch in length or an ounce in weight, and it was evident that having once fixed a standard it was easy to compare results with other lengths and description of wires, and therefore made it possible to determine the resistance of any length of cable. In the resistance-box shown were a number of small coils of wire, which, though they appeared to be of the same size, represented very different values, one of them being one "ohm," and of electricity, and of so delicate a would be possible by it to read signals transmitted th cable from a battery, the size of an ordinary gun cap. in detail, the construction of the galvanometer, whic of a very light and small glass mirror, having attache a magnet, made of a piece of watch spring, and th by a fibre of raw silk between two coils of wire ; he give a practical illustration of the manner in which the in the cable may be determined. Having a coil of ins 1,500 yards in length submerged in a bath of salt w it with the galvanometer and box of resistance coils, t "Wheatstone bridge," and showed the resistance of "ohms." Some of the insulating covering was now re fault in the cable, and tests were again applied from cable, the resistance being in the one case 273, and "ohms," making a total of 296, which showed the f nearly "dead earth," as nearly the whole of the curre it to earth. It was therefore apparent, supposing an "oh to represent a mile of cable, that the fault had occurre about 273 miles from one station, or 23 miles from th Mr. Henry described minutely the various processes an accurate test, and the elaborate calculations that h ensure any degree of certainty.

In reply to the Chairman, Mr. **Henry** said it wa determine the locality of a break in a cable than c insulation in the latter case being so much more impe complete test very difficult. He had recently made between Hobart and Launceston, where a break had proved to be several miles out in his calculation.

The Hon. Dr. **Agnew** proposed that the best thanks passed to Mr. Henry for the extremely interesting lect The subject was an intricate one, and required a o preliminary knowledge before it was possible to gras presented in the course of a single lecture. He was sur one present felt obliged for the practical and scientific matter with which Mr. Henry had favoured th

## OCTOBER, 1884.

The monthly meeting of the Royal Society of Tasmania was held on Monday, October 13. Mr. James Barnard, vice-president, occupied the chair. A large number of Fellows were present.

Mr. J. W. Clunies Ross, B. Sc., F.G.S., Etc., Etc., London, was introduced as a visitor.

### NEW FELLOWS.

The following gentlemen having been previously nominated by the Council, were duly elected as Fellows of the Society:—Messrs. A. Giblin, A. J. Robertson, A. I. Clark, and A. Morton.

### RETURNS, ETC.

The hon. secretary brought forward the usual returns, viz.:—

1. Number of visitors to the Museum, September—Week days, 1,330; Sundays, 740; total, 2,070.

2. Number of visitors to Gardens, 6,220.

3. Plants and seeds received at the Royal Society's Gardens during the month of September. From the Botanic Gardens, Port Natal, 38 packets of seed. From Mr. James Grant, Sydney, 30 do. do.

4. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society Gardens during September, 1884.

15. Common ash, commencing to break.
15. Grape vines commencing to break.
16. Oaks generally commencing to break.
21. Moutan pœony in full flower.
22. Horse chestnut, commencing to flower.
23. Robinia pseudo acacia commencing to break.
20. Sycamore commencing to break.
30. Common plane tree commencing to break.

List of additions to the library, September, 1884:—

The sixty-fourth report of the Council of the Leeds Philosophical and Literary Society. From the Society.

Le Congo Depuis L'Equateur Jusqu'a L'Ocean. From the Institut National De Geographie, Bruxelles.

Records of the Geological Survey of India, vol. xvii., pt. 3, 1884. From the Geological Survey Office, Calcutta.

Bombay Magnetical and Meteorological Observations, 1879 to 1882. From the Meteorological Office, Bombay.

Appendix to the above. From the Meteorological Office, Bombay.

Nature, vol. 30, July, 1884.

Athenæum, July, 1884.

Florist and Pomologist, August 11.

Journal of the Society of Arts, July 4, 11, 18, 25, August 1.

Geological Magazine, August, 1884.

Journal of Science, August, 1884.

Annals Magazines of Natural History, August 4, 1884.

*Agricultural Gazette*, August 4, 1884.

*Gardeners' Chronicle*, August 9, 1884.

1. Extract from the proceedings of the Victoria Institute. Annual meeting, 1884. Speech of Sir J. Lefroy, K.C.M.G., F.R.S.

2. Address to the geographical section of the British Association, by Sir J. H. Lefroy, K.C.M.G., F.R.S. From Sir J. H. Lefroy, K.C.M.G., etc.

Monthly notices of the Royal Astronomical Society. Vol. XLIV., No. 8, June 1884. From the Society.

Monthly record meteorological observations, May, Melbourne Observatory. From R. L. J. Ellery, Government Astronomer.

S. Mullen's *Monthly Circular*, September.

Meteorological Table, India, March, 1884. Fr
Office, Calcutta.

*Agricultural Gazette*, August 18, 1884.

Monthly Record Meteorological Observations
From Mr. R. L. J. Ellery.

The Monthly Weather Report of the Mete
March, 1834, London. From the Meteorological

Vital and Meteorological Statistics of Hob
for the month of September. From the Govern

Meteorological Observations of Tasmania for S
Meteorological Observer.

List of presentations to the Museum :—

### Mammals.

A Tasmanian Tiger, and four young ones, Thyla
Mr. Wm. Turvey.

Two Tasmanian Devils, Sarcocephalus ursinus, M

A Water Rat, Hydromys chrysogaster, Mr. Pro

Three Wallabys, Halmaturus penicillata; Ha
Halmaturus dorsalis, The Trustees Brisbane Museu

### Birds.

Laughing Jackass, Dacelo gigas, Dacelo leachii,
Strepera graculina, Carpophaga magnifica.

Flinders Cuckoo, Eudynamys flindersii, Orthony

Australian Egret, Herodias alba, The Trustees Bri

Pallid Cuckoo, Cuculus inornatus, Mr. E. D. Swa

Summer Bird, Graucalus parvirostris, Mr. Hissey.

2 Black-headed Honeyeater, Melithreptus melano

1 Forty-spotted Diamond Bird, Pardalotus quad
Hinsby.

Wedge-tailed Eagle, Aquila audax, Mr. Webste

Sooty Oyster Catcher, Hœmatopus fuliginosus.

White-breasted Oyster Catcher, Hœmatopus longi

2 Moreporks, Podargus cuvierii.

Jameson's Gull

### Queensland Reptiles.

Grammatophora sp., Grammatophora barbata.
Iguana, Hydrosaurus varius. The Trustees Brisbane Museum.

### Mollusca.

Tasmanian Shells, Mr. H. L. Swift.
A collection of Macroshisma tasmanica, Mr. J. McCance.

### Crustacea.

A Hermit Crab, Pagurus sp., Mr. E. D. Swan.

### Minerals.

A collection of cores, by the diamond drill from the Cascades, the hon. the Minister of Lands through Mr. B. Shaw.

A collection of Sulphur, etc., from the Hot Lakes of New Zealand, with photo. of Hot Springs, Mr. Howard Haywood.

## PAPERS.

A paper, entitled "The River Derwent: note upon the flood of 23rd September, 1884," by Mr. A. Mault, was read by the hon secretary, Dr. Agnew. The paper was written with the object of placing upon record a remarkable variation in the quantity of water passing in the river; calculations of the mean quantity being also given from observations taken during the past two years.

Mr. R. M. Johnston, F.L.S., read a paper, "Observations on six rare fishes, recently captured in Tasmanian waters:—Callanthias Allportiis Latris ciliaris, Erythrichthys nitidus, Centriscus scolopax, Labrichthys Mortonii nov. sp., Oligorus gigas." Mr. Johnston stated that during the last two months several new or rare species of fish had come under his notice, which he had thought desirable to bring under the notice of the society. He said he might mention that Mr. Morton, the curator of the Museum, had been praiseworthy in arousing the interest of local observers in various parts of the island, and it was to him that he was chiefly indebted for three of these interesting forms. The fishes on the western, northern, and north-eastern parts of the island are, as yet, imperfectly known. The recent discovery of the snipe or trumpet fish (centriscus scolopax) at Port Sorell, by Miss Lodder, and the capture of the "Hapuka" Oligorus gigas, and the "Moki" Latris ciliaris, so common in New Zealand, at George's Bay, by Mr. W. L. Boyes, leads one to hope that many new forms from these imperfectly investigated regions will soon be added to our list of Tasmanian fishes.

Dr. Agnew said the Council had a sum of money which was intended to be set apart for a memorial to the late Mr. Morton Allport. The Council had some difficulty in which way the money should be laid out, but it was thought that a small library, including all the latest works on fishes, to be called the Morton Allport Library, would be an appropriate and fitting memorial to the memory of their late friend. (Hear, hear.)

Mr. J. R. McClymont, M.A., read a paper entitled, "Tentative list of Navigators who visited Van Diemen's Land prior to September, 1803." Mr. McClymont stated his object in bringing this paper before the society was mainly to call attention to the paucity of information within our reach regarding geographical discovery in Tasmania—a defect which, he stated, it is increasingly difficult to remedy, seeing that the works which contain such information are being eagerly bought up for the libraries of Europe, America, and the other colonies.

Mr. J. B. Walker said they were under an obligation to Mr. McClymont for his carefully prepared and well considered paper, possessed fewer books about its own history tha it was an astonishing state of affairs. In regard paper which had just been read, he thought it members of the society would oftener take up su geography, and early history of the colony. The only society which could be called a literary or colony, and although the two subjects he referred larly provided for in the rules and constitution of t see why papers dealing with them should not be re phical and Historical Section should not be for which might write papers embodying the results which could be read at meetings of the Section an meetings. There would be one advantage in Sectio the members belonging to it to work together sy preserving those materials for the future history were fast passing away. He suggested that a appointed to confer with the trustees of the Pu Parliamentary Library Committee, with the view of set of works relating to the early discovery and his

The Chairman said it might not be gener was the special object of Sir John Franklin, 40 together all the works relating to the Australa library was established in Lady Franklin's Muse intention was to form a library in the then proje did not know what had become of the collectio

Mr. Walker: There are a few such books Library.

The Chairman said the trustees of the College hand these books over to the society, as their libra place for their reception. At all events these b measure to the public at present, and he thought apart for the special object for which they were coll

Mr. E. D. Swan did not think the trustees woul these books.

number of members in the society. He thought it would be better if the members who took an interest in these subjects met together, and then laid the result of their investigations before the society at their monthly meetings.

Mr. **Justin Browne** thought there should be an arrangement between the libraries about buying such books so as to obtain at least one complete series of all works relating to the colony. There was no necessity for each library buying copies of the same works, many of which were very expensive, but they might so arrange as to make a complete set amongst them. He thought Mr. Walker should put his suggestion in the shape of a formal motion.

Mr. **Walker** then moved,—"That the Council be requested to communicate with the trustees of the Public Library and the committee of the Parliamentary Library with the view of making arrangements for the purchase of books, dealing with voyages to the island, and the history of the colony."

Dr. **Perkins** seconded the motion.

Mr. T. **Stephens**, while sympathising with the general principles of the motion, asked: Where are the available funds of the Royal Society to purchase these books? That was the awkward point, but he hoped there would be some way found out of the difficulty. They must not expect to do too much at first, and by patience the object in view might be achieved. He could tell them at one time there was a much larger collection of works in the public libraries, and the reason of their diminution was not far to seek. He did not wish to find fault with any one, but there had been a great deal of culpable carelessness in lending out books.

Mr. **Walker** thought there was sufficient scope for the action of the society. They were supposed to be a learned body—let them provide the learning and zeal, and the other richer libraries could provide the money. (Laughter.)

The motion was then agreed to.

Mr. A. **Morton**, Curator of the Museum, read a few notes on the "Œstrus ovis, or gad-fly of the sheep." This fly deposits its eggs in the nostril of the sheep, where they are soon hatched, and then crawl up the nostril and frontal sinuses of the sheep, giving great annoyance to the animal so afflicted. Accompanying this paper was one of the grubs, taken from the head of a recently introduced sheep from the neighbouring colonies. The butchers of Hobart state that they have not hitherto noticed the grub in any of the Tasmanian sheep. It is, however, well-known in Europe and the colonies.

Mr. E. D. **Swan** said the insect had been heard of in Tasmania before.

Mr. **Morton** said it was not until that evening that he had learned that the gad-fly had been previously heard of in Tasmania.

Mr. **Park** said he had never heard of many cases, though he had seen sheep protecting themselves from it by boring their noses into the sand.

### VOTES OF THANKS.

Mr. **Justin Browne** proposed a vote of thanks to the gentlemen for their able papers.

Mr. E. D. **Swan**, in seconding, moved that a special vote of thanks be awarded to Mr. Morton for preparing the specimens which had been presented to the society.

The motions were unanimously agreed to.

The proceedings then terminated.

## NOVEMBER, 1884.

The monthly meeting of the Royal Society of Tasmania, the last of the present session, was held on Monday, November 17, His Honor the Deputy Governor (Hon. W. L. Dobson, F.L.S.) in the chair. The Chairman apologised for the absence of the hon. secretary (Hon. Dr. Agnew), who had been called away to Melbourne. The Curator of the Museum, in his absence, brought forward the usual returns. The following were then duly elected as Fellows of the Society :—Miss E. C. Poynter, Signor A. G. D. Bernacchi ; Messrs. H. L. Swift, J. W. C. Ross, B.Sc., F.G.S., W.A. Weymouth, E. Wallack, J.P., J. Andrew, J. W. Syme, R. A. Bastow, H. I. Rooke, M.H.A.

Number of visitors to the Museum, October, week days, 1,273 ; Sundays, 710 ; total, 1,983. Number of visitors to gardens, 6,000.

Seeds received at the Royal Society's Gardens during the month of October, 1884. From Mr. Wm. Bull, London, 5 packets seeds. From Messrs. Pilmorin, Andrieaux, et Cie, Paris, 104 packets seeds.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens, during October, 1884 :—

October 7.—Carpinus betulus commence to break.
October 12.—Ailanthus glandulosus ditto ditto.
October 18.—Tilia europea commencing to ditto.
October 19.—Morus niger ditto ditto
October 24.—Ulmus campestris ditto ditto fall.
October 25.—Melia azederach ditto ditto break.

### LIST OF ADDITIONS TO THE LIBRARY, MONTH OF OCTOBER.

Journal of the Royal Microscopical Society, London, August, 1884, from the Society.

Journal of Science, September and October.

Journal of the Society of Arts, August 8, 15, 22, 29, September 5, 12, 19, 26.

Proceedings of the Royal Society of London, 5 parts, Vols. 35, 36, No. 227 to 231, from the Society.

Proceedings of the Philosophical Society of Glasgow, 1883-4, from the Society.

Meteorological Observations, monthly record, July, 1884, Melbourne Observatory, from R. J. Ellery, Esq., F.R.S.

Meteorological Observations for April, 1884, from the Meteorological Office, India.

Meteorological Report, 1883, for New Zealand, from J. Hector, Esq., M.D., F.R.S.

Meteorological Report, Tasmania, from Commander Shortt, Meteorological Observer.

Vital and Meteorological Statistics of Tasmania for the months of October and November, from R. M. Johnston, Esq., Government Statistician.

Quarterly Weather report of the Meteorological Office, London, Part III., July and September, 1876, from the Meteorological Office, London.

New Zealand Geological Report, 1883-84, from James Hector, Esq., F.R.L.

The Botany of Bermuda, two parts, part 2, by Sir J. H. Lefroy, from the U.S. National Museum.

The Midland Medical Miscellany, from the society.

The Victorian Naturalist, from the society.

Report on the Zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. Alert, 1881-2, from the trustees British Museum

Proceedings and Transactions of the Royal Society of Canada, vol. 1, 1882-83, from the society.

Gardeners' Chronicle, September 6, 13, 20, 27, October 4.

Agriculturist Gazette, September 15, 22, 29.

The Athenæum, August and September.

Nature, August and September.

Geological Magazine, September.

Annals and Magazines of Natural History, September and October.

Florist and Pomologist, September and October.

Statistics of the Colony of New Zealand, parts 4 and 5, for the year 1883, from the Government Statistician.

The Monthly Weather Report of the Meteorological Office, London, February, 1884, from the Meteorological Office.

Uber Rinige Afrikanische, Reptilien Amphibien, und Fische des Naturlastorischen Museum, Von Dr. J. G. Fischer, Hamburg, from Prof. Dr. H. A. Pagenitecher.

Report of Naturlistorisches Museum zu Hamburg, for 1883, from Prof. Dr. H. A. Pagenitecher.

Tasmanian Statutes, vol. 3, M.R., 1337 to 1944, from the Government.

Tasmanian House of Assembly Papers, from Mr. F. A. Packer.

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A collection of Australian and Foreign Animals received from the Trustees of the Australian Museum, Sydney, in exchange for some fishes kindly presented by the Tasmanian Fisheries Commission to the Royal Society.

### Foreign.

Macacus radiatus.

Assamenese Monkey, Macacus assamensis.

A Monkey, Macacus sp.

Squirrel Monkey, Chrysothrix sciurea

Patas Monkey, Cercopithecus ruber.

Long-armed Monkey, Macacus sp.

The Ruffled Lemur, Varecia varius.

The Racoon, Procyon lotor.

The Badger, Meles texas.

The Mungous, Herpestes griseus.

The Stoat, Mustela ermenia.

The English Mole, Talpa Europea.

The Chevrotain Tragulus javanicus.

The English Hare, Lepus timidus.

The English Squirrel, Sciurus Europœus.

The Plantain Squirrel, Sciurus plantani.

The American Chipping Squirrel, Tamias striatus.

### Fish.

An English Salmon, Salmo salar.

### Australian.

An Australian Water Rat, Hydromys chrysogaster.

An Australian Porcupine, Echidna hystrix.

Platypus, Ornithorhynchus anatinus.

Great Flying Squirrel, Petauraist taguanoides.

Grey Opossum, Phalangista vulpina.

Small Headed Squirrel, Belideus breviceps.

Australian Bear, Phascolarctos cinereus.

Queensland Ringtailed Opossum, Phalangista cookii.

Native Cat, Dasyurus viverrinus.

Tiger Cat, Dasyurus maculatus.

Brush-tailed Kangaroo, Petrogale penicillata.

Chestnut-faced Owl, Strix castanops, Mr. Graves.
Spotted Owl, Athene maculata.
Two Wood Swallows, Artamus sordidus, Mr. Geo.
Musk Duck, Biziura lobata, Mr. Lucas.
A Water Crake, Porzana fluminea, Mr. McClusk
Dusky Robin, Petroica fusca.
Cuckoo, Cuculus ornatus, Mr. J. McCance.
Nest and Eggs of Dusky Robin, Petroica fusca, M
Nest and Egg of a Black Cap Honeyeater, Melithre
halus, Miss A. Brent.

### Fishes.

Two Hand Fish, Brachionichthys hirsutus, Miss Ger
Apogon guntheri, Mr. John Martin.
Two Native Salmon, Arripis truttaceus, Mr. J. An
Parrot Fish, Labrichthys mortoni, Mr. W. L. Bo
Seahorse, Hippocamphus abdominalis.

### Reptiles :

A Diamond Snake, Hoplocephalus superbus, Mr. Ge
A collection of Lizards, Hinulia sp., Master E.
A collection of Lizards, Hinulia sp.
A Whip Snake, Hoplocephalus coronoides, Mr. H. L.
A Lizard, Hinulia sp. Mr. Geo. Hinsby.

### Insects :

2 Spiders, Mr. E. B. Gawne.
1 Spider, Mr. J. McCance.
3 Eurymela Speculum, Mr. J. McCance.
1 Beetle, Longicorn sp., Mr. Hissey.
1 Ichneumon Fly, Pimpla entricator, Mrs. Jones.

### Shells etc. :

Mutton Fish Shell, Haliotis nœvosa, Mr. J. R. McC
Comminella Tasmanica, Chiton petholatus, Mr. J.
Land Shell, Bulimus dufresmi, Mr. H. L. Swift.

### Minerals, etc. :

A collection of cores with tabulated report of strata in boring for coal at Tarleton

"On the Determination of a True Meridian," a problem of interest to surveyors, by Mr. H. C. Kingsmill, M.A.

After discussing the various methods usually adopted, and making remarks on the advantages and disadvantages of each, the writer proceeded to describe a method, which, he said, so far as he was aware, was as yet untried. The novelty consisted in a modification of the well-known method of elongations, which rendered a knowledge of the latitude unnecessary for the calculations. It was theoretically simple, but as some unforeseen difficulties might occur in actual work, he hoped that practical surveyors would give an opinion on its merits.

"Observations on Mr. R. M. Johnston's Vital Statistics," by Mr. A. B. Biggs.

Mr. R. M. Johnston, F.L.S., read a paper in reply to Mr. A. B. Biggs' paper entitled, "A rejoinder to Mr. A. B. Biggs' criticism of observations made in respect of the observed periodicity of the death-rate, etc."

In Mr. Johnston's investigations into matters bearing upon the inexplicable wave-like rise and fall of the Australian death-rate, he found that a searching analysis of the ordinary local causes afforded no satisfactory explanation, but appeared to him most probably to be caused by some obscure powerful influence lying beyond and acting strongly through the local causes at regular periods. Having compared their periodicity with the sun-spot period, and with the position of Jupiter in his orbit, he found such a wonderful agreement between the three that with many eminent observers he was inclined to believe that it could hardly be due to a mere chance series of coincidences; although the fact of an underlying causal relation could not be demonstrated owing to the complexity and obscurity of the matters involved. Mr. Biggs agrees with Mr. Johnston in supposing that there may be some causal connection with the sun-spot magnetic declination and death-rate periods, but denies that Jupiter can have any influence whatever upon the several matters referred to. He attempted to show this by a simple comparison of the respective periods of Jupiter's orbit and of Wolf's sun-spot minima and maxima deduced from a mean of observed cycles dating from early in the seventeenth century. Mr. Johnston, however, showed that Wolf's sun-spot observations were not of strict scientific value prior to the time when Schwabe improved the system of sun-spot observations in 1832, *i.e.* just one year prior to the series represented in his (Mr. Johnston's) diagrams, and quoted Balfour Stewart to prove that no exact value can be placed as yet upon the sun-spot periodicity over long periods, and hence any conclusions, positive or negative, based upon a supposed known periodicity of sun-spots for a long period are apt to be fallacious.

Mr. Johnston also stated that even a difference occuring between the periodicity of Jupiter and mean periodicity of the maxima and minima of sun-spot would not be of much value in demonstrating that Jupiter had no influence whatever, direct or indirect upon the development of the sun-spot phenomena; for the problem was a most complex one, and Jupiter was only one of the many supposed factors in the complex problem, which, as yet, is too obscure to admit of proof or demonstration, either negatively or positively. The language of suggestion is, as yet, all that can be admitted scientifically.

Commander Shortt, R.N., Meteorological Observer, read a paper, entitled "Earthquake shocks in Tasmania during the years 1883-1884."

This paper contained a list of the various shocks felt and noticed at the various stations throughout the island during the years 1883-1884. The object of the paper was to afford the member's

over a wid
Mary's, Gould's Country, Kent's Group, etc., befo
ceston, Hobart later still, and South Victoria, w
afterwards. Various sources of error were pointed ou
discrepancies, and the various subjects for investig
to the shocks were also alluded to. Finally, a sh
made to the various theories in connection with
omena, and it was strongly urged that further
observation was required before any theory could
established.

A further explanatory paper on the same subject by
B.Sc., F.G.S., illustrated by models and diagrams,
rough forms of seismometer, by the use of which the
might be more accurately recorded. The forms descri
from simplicity of construction were suitable for use
servers, such as blocks of wood of various sizes to be
shocks, basins containing treacle or other viscid liq

A complete census of the flora of Deal Island, in
was laid on the table by His Honor Mr. Justice Dobs
listed the services of the superintendent of the ligh
land, Mr. Johnston, to collect and send him specime
growing there. These were forwarded to Baron F
who prepared the census. One plant, and orchid, Pte
was new to Tasmania, but was common to the co
tralia.

NOTES AND EXHIBITS.

Mr. E. D. Swan drew attention to an extremely rar
of the common blackcap (Melithreptus melanocephal
been taken at Austin's Ferry, Bridgewater, and pr
museum by Miss A. Brent, Roseneath. Although the
of our commonest, and various rewards offered for
Swan stated this had been the first egg as yet obtai
taken in November is composed almost entirely of woo
pieces of moss, stringy bark, and cobwebs are also us
shaped, two inches in depth, and two in breadth on t
externally the measurements are one inch more ea
suspended by the rim to the small

Tasmania. The nearest approach to it was the common wallaby (Halmaturus Billardieri). Waterhouse says, referring to this species:—"It is readily distinguished from other small species of its group by its short ears, long dark-coloured fur, and the rufous and sometimes yellow tint of the under parts of the body." Gould connects the warmer and more sombre-coloured coat of this species with the dense and humid vegetation of the forests which it frequents, where the sun sometimes does not penetrate at all. He speaks of much diversity of colour, but only on the throat and under surface of the body, which in some specimens are of a deep reddish buff, while others have the same parts much lighter.

### A POPULAR DELUSION.

The Curator drew attention to a small lizard (Hinulia S. sp.) which he produced alive before the fellows, and handled in their presence, saying that it had the reputation of being poisonous, but it was not really so, and if death had ever occurred from a bite from the reptile it must have been caused by sheer fright. Because it had a blue tongue, and was fond of putting it out, the lizard had got a bad reputation, and was called the death adder, but it did not deserve it.

### CLOSE OF THE YEAR.

Mr. James Barnard, V.P., said:—In moving a vote of thanks to the authors of the papers which have been read to us, and to the numerous contributors to our Museum, I desire to congratulate the meeting upon the success of the session of 1884, which has just terminated as shown by the uninterrupted regularity of our evening meetings, and by the number and variety of the papers possessing scientific interest which have been brought forward. During the past year we have had the return among us of our highly-esteemed vice-president and hon. secretary, the Hon. Dr. Agnew—(applause)—whose increasing interest in, and exertions on behalf of, the society we are all prepared to acknowledge and appreciate. (Applause.) We have also had the good fortune to secure the services of a gentleman remarkable for zeal, intelligence, and industry, combined with experience, in the person of Mr. Alexander Morton—(applause)—the curator of the Museum. Full evidence is afforded of the value of that appointment by the improvements which he has already effected in the Museum. (Hear, hear.) I also congratulate the meeting on the large accession of members to the roll of fellows during the past year. Several of those recently elected gentlemen have already contributed papers, possessing scientific merit, and I think there is reason to hope that the session of 1885 will result in unabated interest being shown in the proceedings of the society, and to increase and maintain the advancement of its objects. I have great pleasure in making the usual formal motion—formal, but real—that our thanks be given to the readers of papers, and also to the donors of gifts to the museum. (Applause.)

Dr. Perkins seconded the motion.

The Chairman said that before putting it to the meeting, he should like to call attention to the splendid collection of animals which they had just received from Sydney, and which was in itself almost enough to stock a museum. It was a collection of Foreign animals and the marsupials of Australia, which it would be especially interesting to compare with the marsupials of Tasmania. They had also had a salmon sent to them, so that actually, instead of breeding salmon they were importing stuffed fish from New South Wales. Still it was a very noble fish, and would be useful for purposes of comparison. They had gained 50 new members, and he would also mention that they had no less than 28 papers read before them during the last

## LIST OF PRESENTATIONS TO THE
## THE MONTH OF NOVEMBER AND

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### Mammals.

A Porcupine, Echidna, setosa, Mr. H. L. Swift.

A Kangaroo Rat, Hypsiprymnus apicalis, Mr. W. H

### Birds.

A More Pork, Podargus cuvieri (albino), Master A.

Fulvous fronted Honeyeater, Glyciphila fulvifrons,

A Pelican, Pelecanus conspicillatus, Mr. Parker.

Diamond Bird, Pardalotus punctatus, Master A. Mu

Freckled Duck, Anas nævosa.

### Bird's Nest and Eggs.

A Collection of Bird's Eggs (16 species), Mr. George

A Collection of Bird's Eggs and Nests, Mr. A. Brent

Nest of Spine-billed Honeyeater, Acanthorhynchus R. McClymont, M.A.

### Fishes.

An Elephant Fish, Callorhynchus antarcticus.

4 Mackerel, Trachurus trachurus.

3 Native Salmon, Arripis salar.

4 Soilder, Pentaroge marmorata.

2 Bastard Trumpeter, Latris forsteri.

3 Silver Travally, Caranx georgianus, Mr. F. Self.

### Crustacean.

A Crab, Nectocarcinus tuberculosus, Mr. C. Turner.

### Insects.

1 Brown Moth, Dasypodia silenophora.

1 Moth, Ardices fulvorhita.

1 Beetle, Metriorhynchus sp.

1 Beetle, Lagria grandis, Mr. J. R. McClymont, M.A.

### Ethnology.

A Peruvian God, Lieut. Gilmore, U.S.S. Iroquois.

# PAPERS.

# NOTES REGARDING CERTAIN FOSSIL SHELLS OCCURRING AT TABLE CAPE, SUPPOSED TO BE IDENTICAL WITH LIVING SPECIES.

By R. M. Johnston, F.L.S., etc.

[*Read April* 8, 1884.]

In a paper prepared by me for this Society in the year 1879, I drew attention to the fact that the per-centage of living to extinct species was becoming smaller the more the beds were investigated, and I then ventured to state that on the basis of the per-centage method the fauna indicated the age of the Table Cape beds to be rather eocene than miocene. Recently Prof. Tate has taken up the investigation of the supposed living species, and he informs me that a considerable proportion of them have been compared with original types and have been found to be new species. I need not anticipate him in this matter, however, as he intends to communicate a paper on the subject to this Society. For the present I bring under notice that I have recently compared the living *Pectunculus laticostatus*, of New Zealand, with the fossil shell supposed to be identical with it occurring abundantly in the Table Cape beds, and, as anticipated by me five years ago, I find that the latter form is quite distinct. Splendid specimens of the living species were kindly forwarded to me from New Zealand by Prof. Hutton. I submit a full description of the Table Cape species as follows:—

Pectunculus M'Coyi, Johnston.—*Pectunculus laticostatus* of Tenison Woods and Prof. M'Coy.

Shell orbicular, convex, slightly broader than long, somewhat flattened towards beak, subtrigonal when young. Surface with 29 to 31 regular radiating convex ribs separated by somewhat narrower interspaces; ribs broadening and becoming less convex towards the margin; marginal extremities of ribs rarely obsolete in old specimens; whole surface finely shaply, striated concentrically; hinge teeth, generally 10 on each side the three nearest beak smaller and frequently obsolete on one or both sides in old specimens; inside of margin sharply denticulated; ligamental area depressedly triangular with close **V** shaped striae,—in young specimens, 6—7—in specimens of about 2½ inches long, 8—9, the anterior side of beak having generally one stria more than the posterior side.

Mature specimens 2½ to 3 inches long. This shell, hitherto, has erroneously been referred to *P. laticostatus*, Quoy.

It is very abundant in the Table Cape beds and is identical in every respect with specimens of the same age received from Cape Schanck. A specimen sent by Professor Tate from South Australia is also identical in every respect. The species described approaches more closely in most respects to the existing

*flabellata*, in Tasmania, moreover, is invariably exac
as it is long. It would appear therefore that the el
shell of Table Cape is not identical with living
that it seems to be an intermediate form between
Tenison Woods, and *P. laticostatus*, Quoy, althou
a closer alliance with the former.

From the appearance of the fossil *P. laticosta*
(Pl. xix., Decade ii.) by Professor M'Coy, and fr
cumstance that all the Australian fossil forms exan
are identical with the Table Cape form, it appe
be doubtful whether, on closer examination, th
form referred to by Professor M'Coy will prove to
with the living *P. laticostatus*, Quoy, in all res
however can be easily set at rest.

## NOTES OF SPECTROSCOPIC OBSERVAT COMET "PONS," 27TH JANUARY TO RUARY, 1884.

By A. B. Biggs.

[*Read April* 8, 1884.]

The spectroscope used was a small direct-visio
prism by Browning, the telescope being a refract
aperture. After some difficulty in getting the obj
upon the slit of the spectroscope there flashe

On the evening of 29th January I succeeded in getting the spectrum of a gas flame (common coal gas) turned down to a minute point of blue flame, in juxtaposition with the spectrum of the comet, when, to my surprise and gratification, I found that the three comet lines coincided perfectly with the three conspicuous lines shown in the gas spectrum; the principal difference between the two spectra being, that the gas showed a faint continuous spectrum through all the colours, whilst that of the comet had perfectly dark spaces between the lines, and, so far as I could discern, *no* colour. I cannot say, however, that I might not have obtained a continuous spectrum from the comet had I been able to grasp more of its light. Such seemed to be suggested by the fact that the lines were broadened out towards the violet end, gradually fading away on that side, but were pretty sharp and decided on the side next to the red.

By a contrivance of my own, specially designed for double star measurement, I was enabled to project a dark-field " ghost " scale into the field of the spectroscope, and thereby got the relative positions of the lines from the sodium line D. This line I obtained by sprinkling a little salt in the gas flame. The mean of several observations gave the following results (the readings of my scale being reduced to that of Roscoe's frontispiece), for comparison :—The line D being at 50, the comet lines stood at 59·3, 72·2, and 99·5. Roscoe's carbon lines stand at 60, 76, and 100; also another group at 123 to 128. This latter, however, I did not detect. I think this agreement very close, and what little difference there is may well be accounted for by a difference of material of the prisms and the difficulty of measuring. I may mention that I took the precaution of scaling the principal solar lines during the preceding afternoon for the purpose of comparison. It was evidently chiefly, if not entirely, the *nucleus* that gave the lines, as, on the briefest stoppage of the driving clock, the lines instantly disappeared.

I have contented myself with describing, as carefully as possible, my observation, leaving to others more competent than myself the interpretation of the record. I would venture to remark, however, that my failure to detect continuity in the spectrum would, as I read it, indicate that the self luminosity of the comet must greatly overpower whatever sunlight it reflects.

regret that I had not the opportunity of condu tions from an earlier period when the "glow" grandeur.

Referring to the diagram, the regular solar tinguished as usual—A, B, C, etc. The featu wish to draw particular attention are dist numerals—1, 2, 3, etc.—1 and 2 being the mos I have adopted Roscoe's frontispiece scale—A b at 28, C at 34, and D at 50, etc.

The diagram gives, as nearly as I can show i ance of the spectrum near the horizon when th moderately strong. By far the most promine this spectrum is the line or band (2) at scale noticed that the deeper the glow the broader an this band become. The line (1) at 37 also com prominence at such times, fully equalling, an exceeding C in intensity. This line (1) is, howe sistent, continuing more or less conspicuous th day. (3) At about 44 is a faint line, which is ceptible in the twilight. (4) Is a well-known always more or less conspicuous about the horiz the edge of the green is a very broad band, s good way into the green and somewhat resembling

I noted, on the evening of 26th March, when filled with smoke from bush fires that C and intense; 2 was as usual at times of pretty deep sunset sky was very red on that occasion, evi smoke.

On 31st March (evening), after rain, I note very strong; 2 much

The positions of 1 and 2 I obtained by careful micrometer measurement, the other numbered lines I estimated.

The spectra I have given for comparison (atmospheric and calcium) are the only ones I can find mapped in Roscoe's work that can at all compare with the "glow" spectrum; that of calcium, especially *Bunsen's*, appearing to me to have the most resemblance.

In recording these observations I do so in the position of a *witness*, and not that of a *judge*, hoping that the evidence I have to offer may, in connection with that contributed by others, help in some measure to elucidate the mystery of the phenomenon that has excited so much interest. I dare not venture to offer an opinion upon these observations, only, I would remark, that the idea of calcium vapour being in the air at this time is perhaps not very absurd, considering the vast quantity of limestone that must have been in contact with volcanic heat.

I am not yet prepared to offer a definite opinion upon the deposit which I collected from the January rains. I have submitted it to a partial examination in the microscope, and found the heavier portion, obtained by precipitation in water, to consist, apparently, chiefly of silicious particles, intermixed with insect exuviæ, etc.; also a few particles of magnetic substance, somewhat pear-shaped, evincing, in proximity of a magnet, decided polarity. The lighter washing exhibited, microscopically, a marked resemblance to a specimen of volcanic dust with which I compared it.

This volcanic dust specimen was given me by Mr. Dean, sen., of Launceston, who obtained it, I believe, from the captain of the ship upon which it fell in the vicinity of Sunda.

## REFERENCES TO BARON CONSTANTIN VON ETTINGSHAUSEN'S RECENT OBSERVATIONS ON THE TERTIARY FLORA OF AUSTRALIA,

By Baron Ferd. Von Mueller, K.C.M.G., M.D., F.R.S., F.G.S., Etc.

[*Read April* 8, 1884.]

The 47th volume of the Imperial Academy of Science, Vienna, issued this year, contains an important essay on tertiary vegetable fossils of Australia, the results of original

Baron von Ettingshausen, on this present o
extensively to leaf impressions obtained by Dr.
(one of the surgeons of Sir James Ross' antar
during the stay of the Erebus and Terror at
travertin of the country adjacent to the entranc
went; and this distinguished palacontologis
an opportunity, through the authorities of the B
to examine the specimens of fossils collected
region by Mr. R. M. Johnston,—the very mat
the last-mentioned zealous and circumspect
already some general accounts, accompanied b
drawings in the proceedings of the Royal Societ
1873, 1874, 1879, and 1881, determining at the
precise geologic age of these tertiary layers.
united Tasmanian collections Baron Von Etti
defined 33 species, which he assorts into 21 gene
to 16 natural orders. As the "Denkschriften
Akademie" may not reach many of those wh
interested in these enquiries, it may not be out
give a list of the fossils thus named and diagnos
lithograms enrich this treatise, so that no dif
arise to trace out the now described species under
designation at the places of discovery; this is
facilitated by citations of Mr. Johnston's illustr
of the species.

Myrica Eyrei (Johnston f. 5).
Betula Derwentensis (Johnston f. 10.)
Alnus Muelleri (obtained at Risdon.)
Quercus Tasmanii (obtained at Risdon.)
Fagus Risdoniana

Cordia Tasmanica (obtained at Risdon.)
Premna Drummondi (Johnston f. 2, 25, 26.)
Sapotacites oligoneuris (Johnston f. 1, 30.)
Sapotacites achrasoides.
Ceratopetalum Woodii.
Ceratopetalum prae-arbutoides (Johnston f. 35.)
Sapindus Tasmanicus.
Elaeocarpus Bassii (Johnston f. 57, 60; obtained at Beaconsfield.)
Cassia Flindersi (Johnston f. 13.)
Phyllites populiformis (Johnston f. 20.)
Phyllites ficiformis (Johnston f. 11.)
Phyllites juglandiformis (Johnston f. 28.)
Phyllites ligustroides (Johnston f. 22.)
Phyllites pyriformis (Johnston f. 23.)
Phyllites phaseolites (Johnston f. 4.)
Phyllites sophoræformis (Johnston f. 9.)
Phyllites mimosæformis (Johnston f. 31.)
Carpolithes gaertnerioides (Johnston f. 34; obtained from Pipeclay Bluff.)
Carpolithes Risdonianus (from Risdon.)

From this list it will be observed that Baron Von Ettingshausen refers unhesitatingly fully half the plants, the leaf impressions of which he had from near Hobart before him, to genera of the existing vegetable world; some, however, he places into genera solely established for the systematic reception of vegetable relics of former ages, while Phyllites also, here as elsewhere, becomes the generic receptacle for fossil leaf—remnants not readily referable to any defined generic group of plants, whether living or extinct—whereas Carpolithes serves for keeping together by prevalent palaeontographic usage some fruits of obscure affinity, generally regarded as gymnospermous, but not always congeneric, and sometimes, perhaps, not even co-ordinal.

Were I to be allowed to offer a suggestion on a subject, which from its very nature must be perplexing, it would be to recommend a preference of new generic names for all such organic remnants as cannot be put with any degree of certainty along with generic forms now living, nor can safely be placed into clearly defined fossil genera, as this would not commit us to fix the exact systematic position of any organism, known only from fragments quite insufficient for that strict generic recognition which, for instance, would be expected from dealing with Laurineae, in the sense of living genera of that order, the corresponding exact circumscription of which for fossils, even if flowers and fruits were always or finally obtained, would ever remain an impossibility. Thus only in such cases would the generic name of living organisms become adopted for such an extent, and of such a similarity, as t mere presence of some peculiar foliage, characteristic by itself for any particular gen tising on mere leaf forms, especially if such extensive anatomic knowledge, as Baron Vo displays, is brought to bear on such fossils; almost infinite forms, some of which not rar various genera and even different orders of pl leaves throughout the whole wide creation identification, unaided by floral and fructify hazardous in the extreme, even to the m scrutator.

Incidentally it should perhaps here be men owe the earliest records of tertiary Tasmania Paul de Strzelecki, who in his valuable vol description of New South Wales and Van D 254 (1845), offered a note by Professor J. Mo impressions and a branchlet fossil in the Hobart, all three delineated on plate vii. of hi adds that the celebrated Charles Darwin, whos lately to deplore did notice already the occurre a supposed Palm in the same deposit.

The essay presented to us by the celeb palaeontologist, is, independent of its special also of general importance, inasmuch as he opinion that the whole existing vegetation of t its development be traced to an universal o bygone geologic ages, a conclusion from pala first drawn distinctly by Baron Von Ettingsha foreshadowed by existing vegetation of Australia, nor any having been found in a fossil state previously in this part of the globe, although South-Eastern Australia and New Zealand possess—as well-known—the co-ordinal genus Fagus. This announcement of the occurrence of an Alder in the Tasmanian Travertin is all the more to be appreciated, as Mr. Johnston was fortunate enough to detect a fruit, amentum of this plant; a fact like this should encourage Tasmanian geologists to persevere in further searches after carpologic specimens in the rich and very accessible beds of fossils in their island. Schimper in 1872 enumerated 30 fossil species of Alnus, but only seven of these were any amenta procured by the several finders, the rest were described from leaves alone, and must therefore remain doubtful as regards generic and specific limits.

The prospect of Dr. Barnard settling professionally in his native city, holds out much additional hope for revelations in the fossil flora of the vicinity, after that talented gentleman has aided already so much in elucidating the pliocene vegetation of Gulgong.

It remains to confirm the systematic position now given to the above-mentioned Tasmanian pliocene plants by searching for fruit traces, irrespective of the likelihood of future investigations, proving that in Tasmania, as in many other parts of the world, the pliocene vegetation to which Alders were immixed, was also one of great richness in specific forms, few of them as yet known to us.

## NOTES OF A CRITICAL EXAMINATION OF THE MOLLUSCA OF THE OLDER TERTIARY OF TASMANIA, ALLEGED TO HAVE LIVING REPRESENTATIVES.

By Professor Ralph Tate, F.G.S., F.L.S., Etc., Corr. Memb.

[*Read June* 9, 1884.]

Mr. R. M. Johnston, in Proc. Roy. Soc., Tasmania, 1880, p. 31, gives a list of Table Cape fossils, which have been referred to existing species. As I think that some of them have been incorrectly identified I am desirous to give explanatory reasons for the adoption of other names. Before doing so, I may remark that in my presidential address to the Royal Society of South Australia, vol. ii., p. lvi., 1879, I gave a list of 24 living species of various classes which existed in the Australian

belong to th
which they have respectively been refer
have carefully compared these fossil spe
ones bearing similar names from diffe
European seas. I regret that I cannot
Woods' identifications."

In the accompanying table I have se
Table Cape fossil species and the recent
some of them have been confounded; the
species represented in living creation are p
must not be supposed that seven species
between the older tertiary fauna of Aust
one, as a much greater amount of material
than has already been scrutinised, and whi
yield a few species having living identities.

| FOSSIL SPECIES. | RECENT SP THEY FOUNDE |
|---|---|
| 1. Ancillaria mucronata—*Sow.* | Ancillaria a |
| 2. Triviaa vellanoides—*McCoy.* | Trivia Euro |
| 3. Leiostraca Johnstoniana—*Tate.* | Leiostraca sp. |
| 4. *Syrnola bifasciata—Woods.* | |
| 5. *Crossea labiata—Woods. (?)* | |
| 6. Liotia lamellosa—*Woods.* | Liotia subqu |
| 7. Liotia Roblini—*Johnston.* | |
| 8. Natica polita—*Woods.* | Natica Bedd |
| 9. Fissurellidæ malleata—*Tate.* | Fissurella co |
| 10. Cylichna Woodsii—*Tate.* | Bulla arachi |
| 11. *Dentalium lacteum — Deshayes.* | |

### ANCILLARIA AUSTRALIS.

*A. australis* of Tenison-Woods, from the Table Cape beds, is certainly not Sowerby's species of that name. It should bear the cognomen *A. mucronata*, under which it is catalogued as a Table Cape fossil, by Tenison-Woods, in Proc. Roy. Soc., Tasmania, for 1875, p. 17, and as " one of the very few forms surviving in the present series," but in his census of the Marine Shells of Tasmania, loc. cit., 1878, p. 30, he corrects that statement, remarking that " *A. mucronata*, Sowerby, in Thes. Conch., Anc., p. 63, t. 211, fig. 11, is believed to have been described from the Lower Cainozoic beds at Table Cape. . . . Mr. Legrand informs me that he has never found it but as a fossil."

The differences between *A. australis* and *A. mucronata* are apparently trifling, but they are constant. Comparing them at the size represented by a length of about 25 millimetres :— *A. mucronata* has an ovate outline of an uniform width throughout, gradually tapering to a subtruncate mammillary apex; the pullus is concentrically costate-granulate. In *A. australis* the outline is ovate-fusiform, rapidly tapering to a subacute apex; the last whorl is relatively much enlarged. With a length of about 40 millimetres the differences are not so obvious, though *A. mucronata* is a narrower shell and shows traces of a mucronate apex.

Here are the various dimensions in millimetres of a large example of each species :—

| | *A. mucronata.* | *A. australis.* |
|---|---|---|
| Total length ... ... ... | 38 | 39 |
| Length of aperture ... ... | 20 | 25 |
| Breadth of aperture ... ... | 8 | 8 |
| Greatest breadth... ... ... | 18 | 19 |
| Length of spire ... ... ... | 19 | 17 |

*Localities.*—Table Cape, *R. M. Johnston.* Muddy Creek, near Hamilton, Victoria; and " Gastropod-bed " in the River Murray Cliffs, near Morgan, South Australia, *R. Tate.*

### TRIVIA EUROPÆA,

Believed by Tenison-Woods to occur at Table Cape as a fossil (loc. cit., 1877). This identification is based upon young or dwarfed examples of the widely distributed Australian fossil, *T. avellanoides, McCoy*—the distinctive characters of which have been fully pointed out by the author of the species in his definition of it. Most particularly are the ribs sharper in this fossil cowry than in *T. Europœa.*

Tenison-Woods figures an early stage of growth of this species as *T. minima* in Proc. Linn. Soc., N.S.W., vol. iv., t. 1, f. 8, 1879, relying for a differential character on the absence of a dorsal division between the ridges. He judged, more-

Aldinga Cliffs; and bore-hole at Adelai

### SYRNOLA BIFASCIA

*Reference.*—Tenison-Woods, Proc.
1875, p. 145.

This recent Tasmanian gastropod-she
by the author of the species as a foss
beds (loc. cit., 1876, p. 99). The species

### EULIMELLA SUBULA

This name was applied by Tenison-W
the Table Cape beds, an example of whi
R. M. Johnston, I forwarded to Mr. Gwy
parison, who most authoritatively stat
species, and which I propose to name *Lei*

### NATICA POLITA.

*Reference.*—Tenison-Woods, Proc. R
1875, p. 23.

Originally described as a Table Cape
been found living off the Tasmanian c
p. 32). I have not seen recent examples

### CROSSEA LABIATA.

*Reference.*—Tenison-Woods, Proc. Ro
1875, p. 151.

This living Tasmanian shell has been r
Cape fossil by Mr. R. M.

This species was described from a Table Cape fossil, but the author appended a note, that a living example had been dredged off the Tasmanian coast.

Having had the opportunity of comparing recent and fossil specimens I found differential characters to obtain such as are set forth in Proc. Linn. Soc., N.S.W., 1878, p. 236, wherein Mr. Woods has applied the name of *L. subquadrata* to the living species.

### LIOTIA DISCOIDEA.

The species so named by Reeve is living on the coast of the Philippines, and extends to Tasmania. It has been quoted by Tenison-Woods as a Table Cape fossil, but Mr. Johnston gives valid reasons for rejecting that identification and has described the fossil under the name of *L. Roblini* in Proc. Roy. Soc., Tasmania, 1880, p. 39.

*L. Roblini* is abundant in the Muddy Creek beds, and a few examples have been collected by me from the " gastropod-bed " in the River Murray Cliffs, near Morgan.

### IMPERATOR (AUSTRALIUM) IMPERIALIS.

This recent New Zealand species is included, with a doubt, in the list of Table Cape fossils, by Mr. R. M. Johnston, in Proc. Roy. Soc., Tasmania, 1876, p. 90.

### FISSURELLA CONCATENATA.

The Rev. Tenison-Woods referred a Table Cape fossil to Crosse's species from South Australian waters, but which appears to be conspecific with *Fissurellidæa malleata*, mihi, in Trans. Roy. Soc., S. Aust., vol. v., p. 146, 1882.

### DENTALIUM LACTEUM.

" Living in the Indian Seas. This is a doubtful identification. The fossil is very common, and may be a variety only." Tenison-Woods in Proc. Roy. Soc., Tasmania, 1875, p. 17.

I have not seen a Table Cape specimen of this species, but a Dentalium common in the Muddy Creek beds agrees well with the figure, measurements, and description given by Deshayes in his monograph of the genus.

### CYLICHNA ARACHIS.

" Still living in Tasmania and Australia, and not uncommon in the Table Cape beds." Tenison-Woods in Proc. Roy. Soc., Tasmania, 1876, p. 102. The same author, in dealing with another species from the Miocene deposits at Muddy Creek, refers to it as " one of those specimens which may, perhaps, be identified with Quoy and Gaimard's shell," and then pro-

in Bass Straits, is inclu
Johnston in his list of Table Cape foss
Tasmania, 1879, p. 41).

Judging from Mr. Johnston's unpublis
only specimen said to have been found i
deposits, I think there cannot be a doubt
of the identification, but grave suspici
habitat, which cannot now be cleared up
condition of the fossil, or to the nature o
specimen has been lost. Mr. Johnston w
doubt whether the specimen may not ha
some of the fallen masses in which po
living shell had got mixed up. . . .
this shell doubtful for the present."

### CUCULLÆA CONCAMERAT

Is quoted by Tenison-Woods, *loc. cit.*, 1
Johnston, *id.*, 1879, p. 31, as a Table C
latter author, in a former paper, refer
*Corioensis*, making no mention of *C. conca*
that McCoy, in his earlier reports, gives C
fossil in the Older Tertiary of Victoria,
subsequently abandoned for *C. Corioensis*,
by him as a new species, closely related
The two names have doubtlessly been us
by the Tasmanian geologists, especially
informs me that there is only one form at

### LIMOPSIS AURITA.

*insolita* in Darwin's "Geology of South America," wherein it is reported from the Eocene of Chili. Zittel records it from the Eocene of New Zealand. The Tasmanian fossil agrees with *L. aurita* as figured and described by McCoy.

### LIMOPSIS BELCHERI.

This living species was originally scientifically made known from specimens taken off Cape of Good Hope, but it is now known in Australian waters from St. Vincent Gulf to Portland, and has been recognised as an Older Tertiary shell by McCoy and by Tenison-Woods in the Table Cape beds.

### PECTUNCULUS LATICOSTATUS.

I do not acquiesce in Mr. R. M. Johnston's rejection of the above name for the species so common in the Table Cape deposits, which he names *P. McCoyii.* (Proc. Roy. Soc., Tasmania, for 1879, p. 41.) An allied species is plentiful in the River Murray Cliffs, near Morgan, but it has more resemblance to the Australian species, *P. flabellatus* of Tenison-Woods, than to the New Zealand *P. laticostatus.*

### CORBULA SULCATA.

"This species is still living on the west coast of Africa as Prof. McCoy (Ann. Mag. Nat. Hist., 1866) has pointed out. It is very characteristic of the Australian Lower Cainozoic," so writes Tenison-Woods in Proc. Roy. Soc., Tasmania, 1874, p. 16. I have no means of ascertaining what amount of reliance is to be placed on McCoy's determination; but so far as regards the Table Cape shell, which has been quoted under the above name, I find that it bears no resemblance to any of the figures of the Lamarckian species that I have been able to compare it with. It seems, however, to be closely related to *C. fortisulcata* (Smith in Proc. Zool. Soc., 1878, t. 50, f. 23, p. 819), from Port Essington, and for it I propose the specific name of *ephamilla.*

### LIMATULA SUBAURICULATA.

"This shell is a common fossil at Table Cape, at least I can discover no difference in size, shape, markings," etc. Tenison-Woods in Proc. Roy. Soc., Tasmania, 1876, p. 113.

Specimens of the fossil species from Table Cape and some South Australian localities were forwarded to Mr. Gwyn Jeffreys for comparison with the European shell. He not only alleged its specific distinction, but forwarded me examples of *L. subauriculata* and other allied living species. The differences justify a distinct appellation for our fossil, and I have pleasure in associating Mr. Jeffrey's name with it.

Nor'-West Bend; and at Aldinga Bay, S

RHYNCHONELLA SQUAMC

This palliobranch, common to the Olde Australia, Victoria, Tasmania and New be catalogued among recent species, as I *R. nigricans, var. pixydata,* Davidson, in " Challenger Expedition, t. 4, f. 14, p. 59, representative.

The differential characters of the so-cal are the more numerous scaly ribs (40 t transverse and comparatively more conv upon which Hutton founded the specie the differences are not mere individual va be regarded as of specific value, so largel facts of the present and past distribution

*R. squamosa,* as an existing species, is k water off south of Kerguelen Island, and Older Tertiary of South Australia, Victo New Zealand. *R. nigricans* extends in ti Tertiary formation to the recent epoch in has not been found in association with *R* in the Oamaru formation in New Zealand.

## ON THE COMMUNITY OF SPECIES PULMONATE SNAILS BETWEE

from *L. peregra*;" and in the same volume, at p. 27, Mr. Johnston expresses the opinion that *L. Hobartensis* and *L. Launcestonensis* are merely varieties of the same species, while finally Mr. Petterd has stated that *L. Huonensis* is identical with *H. Launcestonensis* and that *L. Tasmanica* is the European *L. stagnalis*. Thus the four species of Tenison-Woods are reduced to two, considered to be identical to European forms, and at the same time the genus is erased from the Tasmanian fauna.

So far as regards one of the species, I protest against its absorption in *L. peregra*. Without a comparison with specimens named from the types, I am not sure of my identification, but the species, which I claim to be indigenous, is probably *L. Huonensis*.

Some years since I received from Mr. R. M. Johnston a few examples of a Limnaea, which fairly agree with the diagnosis of *L. Huonensis*, but when the validity of the species came to be challenged, I compared them with actual specimens of *L. peregra*, and though I could not concur with the opinion that they were identical, yet as my examples of *L. Huonensis* were few and imperfect, I could not assert with confidence an opinion to the contrary, and thus in my catalogue of Australian freshwater shells (Proc. Linn. Soc., N.S.W., vol. v., p. 552), *L. Huonensis* and the three other Tasmanian species are expunged from the list of endemic species. Since then, the question has been reopened by the discovery of the same species on our Continent in a locality that precludes the possibility of accidental introduction; to the better identification of the continental shell, Mr. R. M. Johnston has lately forwarded a sufficient number of examples of what is doubtlessly *L. Huonensis*, and the result of my comparison is that they are identical with that species and specifically distinct from *L. peregra*.

The new locality for *L. Huonensis* is on marshy ground, produced by the issue of freshwater from beneath the sand-dunes which line the margins of the backwaters of the estuary of the River Glenelg.

At this station, *L. Huonensis* has much the habit of *L. truncatula* of Europe, living at the water's edge or amidst the damp herbage; it is profusely abundant.

The very large number of examples examined permits to say that *L. Huonensis* is constant in its characters, which do not fall within the limits of variability of *L. peregra*. The European analogue of *L. Huonensis* is *L. peregra*, from which it may be distinguished by the almost obsolete fold of the columella, concealed by one thin and broad expansion; in the less oblique revolution of the whorls and in the more regularly pointed spire; also by the simple margin of its

*peplea papyracea.* The association of the tw
serve to fix the station and locality of this ad
fauna of Tasmania.

*A. papyracea* was originally described fro
obtained from a dried pool at Penola, S. Au
year later it was taken alive in the Reedbeds,
and a study of the animal brought about th
appellation.

The species is now known to me, from sample
J. F. Bailey, to inhabit at Merrigum, Victoria.

### GUNDLACHIA PETTERDI (*Johnston*)

This freshwater limpet, originally described fr
specimens, inhabits the hill-streams of the
Range, near Adelaide.

These are the first records of continental spec
pulmonate snails living in Tasmania, and it
that no other specific points of contact have bee
As regards the land snails, whose means of
limited, the distribution of whose species is so re
correlatively presenting constant characters so
they are valuable factors in defining zoologica
there are seven or nine species in common betwe
and Australia. (See Tate, Trans. Roy. Soc., S.
p. 73, 1881.) On the other hand, the aquati
snails are in comparison easily dispersed, and
exhibit great morphological variability, so muc
regards the commoner sorts, each hydrographic
own *races.* There is, therefore, much

those embarrassing facts touching the mutability of species which have been gained by a wider experience.

A revision of the nomenclature of the freshwater shells of Australia is urgent, and I venture to offer my help in instituting a critical comparison of the Tasmanian species, *inter se* and with continental forms. For this purpose it is absolutely necessary that the collections submitted for examination be large and varied.

## NOTES ON BORING OPERATIONS IN SEARCH OF COAL IN TASMANIA.

By T. Stephens, F.G.S., Etc.

[*Read June* 9, 1884.]

The attempt which is being made, by means of the diamond drill, to test the question of the existence of deep lying seams of coal at Tarleton, on the Mersey, and near the Cascades Brewery, at Hobart, calls for some notice. The work is not yet so far advanced as to demand more than a brief statement of the circumstances under which it has been undertaken. It is probably pretty generally known now that the seam of coal which has been worked for many years past, in the Mersey district invariably underlies certain marine calcareous beds, the presence of which was formerly supposed to indicate that the base of the coal measures had been reached. This feature is absent from the coal measures of the Eastern and Southern districts, and all such evidence as is forthcoming leads one to suppose that the latter belong to a later epoch than those of the Mersey and other districts bordering on the North Coast.

To go fully into this question would require more time than I can command, and no definite conclusion can be arrived at until a reasonably complete series of specimens of the plant remains of the several formations is available for comparison and examination. For the basis of a provisional classification I will take the succession of rocks composing or associated with the coal measures of New South Wales, with which Tasmania has more in common than with any of the other Australian Colonies. The following is a rough outline of the order in which they occur:—

| | |
|---|---|
| Triassic (?) ...... | Wianamatta shales.<br>Hawkesbury rocks. |
| Permian (?) ...... | Upper coal measures (Newcastle coal). |
| Carboniferous | Upper marine beds. |
| | Lower coal measures (Anvil Creek, Greta, and Stony Creek coals). |
| | Lower marine beds. |
| | Lower carboniferous, Port Stephens, etc. Plant and marine beds (without coal).

Premising that the evidence is very incomplete, I may say that the coal measures of the South and East of Tasmania may probably be roughly classed with the upper coal measures; the marine beds of the Mersey with the upper marine; the Mersey coal with the lower coal measures; and the sandy and calcareous rocks with marine fossils, which occur near Hobart and in numerous localities on the South and East, as well as in the interior, with the lower marine beds of New South Wales.

In a paper read before the Royal Society, on the 8th July, 1873, I mentioned some of the circumstances which made it improbable that any lower seams would be found in the Mersey coalfield. Nothing, however, had been disclosed by mining operations which could be taken as conclusive evidence on this point, and, to set the question at rest, it was necessary to have recourse to other than private enterprise. The boring at Tarleton has not yet, so far as I can judge from casual reports, yielded any encouraging results; but this is no more than might have been expected, and the object for which the work was undertaken by the Government will not have been attained until a greater depth than 200 or 300ft. has been reached.

The first suggestion in reference to exploration for coal near the Cascades Brewery came from abroad. At a meeting of the Royal Society of New South Wales, Mr. C. S. Wilkinson, the Government Geologist, drew attention to a collection of fossils from the above locality, and remarked that as seams of bituminous coal and kerosene shale occur in formations containing these fossils in New South Wales, it was probable that coal might be found associated with them in Tasmania. An opinion from so eminent an authority necessarily carries great weight, but it is right to say that Mr. Wilkinson spoke from an examination of the fossils alone, and had nothing before him to show whether they came from rocks corresponding with the upper marine, or with the lower marine beds of New South Wales.

The Government having been urged to test the question of the existence of seams of coal near Hobart, at a greater depth than had been reached in the workings at New Town, Mr. F. M. Krausè, F.G.S., of Ballarat, was engaged to report on the subject. After carefully examining the New Town coalfield, and ascertaining that the lower part of the series was already exposed in natural sections, Mr. Krausè selected two spots in the underlying marine formation, at one of which the diamond drill has been at work for some months. Supposing that Mr. Krausè's theory as to the age of the New Town coal measures, and that of the marine beds, which latter he classes as *dyas*, is correct, there are reasonable grounds for expecting that true coal measures may be met with below, though at an unknown depth. If, on the other hand, I am right in classing our Southern marine formations with the lower marine beds of New South Wales, the probability is that no coal will be found underneath them, and I am inclined to think that their thickness is to be measured by thousands rather than hundreds of feet.

The Minister of Lands (the Hon. N. J. Brown) has kindly promised to present to the Museum a complete series of specimens obtained from the borings at Tarleton, and the Cascades, when the whole question can be more fully discussed.

# DESCRIPTION OF A NEW SPECIES OF VITRINA FROM THE TRAVERTIN BEDS, GEILSTON.

BY ROBT. M. JOHNSTON, F.L.S., ETC.

[*Read June* 9, 1884.]

### VITRINA BARNARDII (*n. s.*).

Shell minute, depressed, auriform; whorls 2¼, rapidly increasing; surface irregularly rugosely striate towards peristome; peristome simple, right margin slightly dilated forward; columella concealed, but, evidently, resembles the living *V. Verreauxi* in this as in other general characteristics. Greatest dia., 8mil.; least, 5½mil.; depth, 3mil. Travertin Beds, Geilston (one specimen).

The above fossil shell differs from *V. Verreauxi* in being much smaller and in being more depressed. The whorls, relatively, increase more rapidly, and the surface markings are more rugose. It is associated with ***Helix Tasmaniensis*, *H. Huxleyana*, *H. Geilstonensis*, *H. Sinclairi*,** and ***Bulimus Gunnii*** in the lower beds of the Travertin.

I have named this shell in honour of our worthy vice-president, Mr. Barnard, who, for many long years, has taken a most active interest in all matters relating to the progress of the natural history of this island.

It is somewhat singular that remains of freshwater shells should not have been discovered hitherto in these freshwater deposits. It would seem that the waters, during the time the lower Travertin beds were being formed, were unfavourable to animal life*; and that the remains of land animals, found hitherto in such abundance, were carried to their present position by a stream draining the land slopes in the immediate neighbourhood.

*See "Discovery of Entomostraca in the upper members," in following paper, as proof that the upper members of the deposit were at least favourable to the life of a species of cypris. R. M. J.

which we met I int
Society that Professor Tate was energetically
the important work of thoroughly determinin
some of the more difficult points of classificatio
to the fossil species of the Australian Mar
which were supposed to be identical with living

On that occasion, also, I pointed out that th
formerly referred to the living *Pectunculus latic*
very distinct species not identical with any
form, and accordingly I proposed for it the
*McCoyi.* Since that time I have received thi
communications from Prof. Tate prepared for
In one of them I am gratified to find that this
naturalist concurs with my determination in
*McCoyi.* He also, among other suggestions, d
re-examine and compare carefully the fossil fo
referred to with the living types supposed to
with them, as he had doubts regarding the c
their determination. Through the kindness
Beddome, who placed his valuable collection
types at my disposal, I was enabled to carry ou
and as there was not sufficient time since the
the results of my examination to be communica
Tate, and afterwards included in his communic
Society, I have thought it best to prepare a s
upon the matters referred to me.

The fossil forms more particularly referred
re-examination and comparison with living ty
following :—

1. *Crossea labiata*—Ten Woods. Fossil f

### CROSSEA LABIATA (*Tenison-Woods*).

The fossil shells, originally referred to the living species described by Rev. J. E. Tenison-Woods, were again submitted by me to a most careful comparison with a fine collection of living forms. As the result of this examination, I still find that, although the fossil representatives are decidedly larger than the living ones, there are no characteristic differences between them, so far as the tests are concerned, if we except the fact that in the living form the varix bordering the aperture is generally sharper and more decidedly reflexed. This character is constant in all the individuals—nine or ten—examined by me. In the fossil representatives the striae upon the varix are almost obsolete, and, consequently, the latter has not that appearance which Mr. Woods describes as "fringe-like." It must be confessed, therefore, that it would be difficult to separate the living from the fossil so far as absolute differences are concerned. Still, so far as the trifling differences go, I must admit that they are sufficiently constant to enable a careful classifier to recognise the living from among the fossil representatives with a considerable degree of confidence, and, perhaps, for these reasons, it might be well to recognise the constant differences, slight though they may be, as of specific value. I hesitate myself to decide in such a case, until I learn how far the Table Cape fossil form agrees with the fossil forms discovered in the same horizon in the South Australian and Victorian formations, which have now been so fully investigated by Professor Tate.

### NATICA POLITA (*Tenison-Woods*).

Curiously enough, of the two representatives—the fossil and living—hitherto known as *N. polita*, the fossil was the first known to science. The living form was discovered almost immediately after the fossil form was described, and was determined by Mr. Woods to be conspecific with the latter. On comparing a large series of living and fossil forms together, however, I find the following differences to be constantly maintained. In the living form the spire is more depressed, and the whorls increase more rapidly in size. In the fossil form the nucleus is invariably smaller than in the living representative, and the number of whorls in mature specimens is 4½. In the living mature form the number of whorls is invariably 3½. The aperture in both does not present any marked difference, if we except the fact that, in the fossil state, the inner margin is almost vertical. In the living form, the same feature is more decidedly angled relative to a central line drawn through the nucleus. If anything the

largely added to our knowledge of the m
Tasmania.

## TRIVIA EUROPEA.

The small or dwarfed fossil specimens coll
Table Cape were originally referred to—*T. E*
Woods. In his "Notes on the Fossils" o
p. 91, Proc. Roy. Soc. of Tas, 1876, he s
*Europea* and *Eulimella subulata* are European
believe, occur at Table Cape as fossils." I am
however, from examination of a larger number
that all the specimens of the former so deter
Woods are dwarfed or young representatives of
*noides*, McCoy. This fossil also occurs in the t
stone of Flinders' Island. Fragments of
abundant on the beaches on Barren, Badger, Cla
Islands in Bass' Straits. The fragments are u
ashore attached to seaweed, and in one collec
Swan Island I disclosed the cast of a s
characterised *T. avellanoides*, associated with
fossils too imperfect for specific identificatio
the following genera, viz., *Cylichna*, *Voluta*,
*Lima*, *Tellina*.

## TRIGONIA ACUTICOSTATA (*McCoy*).

Although this species was included in my '
Table showing Distribution of Australian M
Shells," etc., pp. 90a., 90f., Proc. Roy. Soc.,
did not refer it to the Tabl

advanced in size, and even then the blunted costate lamellæ are all closely crowded at the extreme margin of valves.

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### SYRNOLA BIFASCIATA.

I have in vain searched for a fossil representative of this shell in my type collection, nor can I trace any in the collection belonging to this Society. I am therefore of opinion that a very distinct fossil species, named by me *Odostomia*, has been mistaken for *S. bifasciata*. *Odostomia microlirata*, mihi, somehow was omitted to be published by me. I now give the description :—

*Odostomia microlirata* (*n.s.*)—Shell minute, white, shining, elongately conoid, turriculate; spire acute; nucleus exerted, twisted sinistrally; whorls 8½, flattened, surface finely obsoletely striated concentrically, crossed by very fine wavy microscopic liræ; suture distinct; aperture sub-auriform; outer lip thin; columella uniplicate. Length, 8mil.; great. dia., 2mil.

This fossil shell somewhat resembles the living *Syrnola bifasciata*, but it is easily distinguished from it by the twisted nucleus, its greater size, and the fine obsolete liræ. Two or three specimens discovered by me in the Table Cape beds.

From the excellent figures and descriptions contained in Professor Tate's monograph "On the Australian Tertiary Palliobranchs," Trans. Phil. Soc., Adelaide, 1880, I have also been enabled to identify a number of previously undetermined specimens of Brachiopods in my collection originally derived from the Table Cape beds. The following is a complete list of the Brachiopods now known to me as occurring at Table Cape, viz. :—

*Terebratula vitreoides*—Woods
*Waldheimia Garibaldiana*—Davidson
„ *furcata*—Tate
„ *grandis*—Woods
„ *Johnstoniana*—Tate
„ *Tateana*—Woods
„ *Corioensis*—McCoy
„ *pectoralis* (?)—Tate
*Terebratulina Scoulari* (?)—Tate
„ *lenticularis*—Tate
„ *triangularis* (?)—Tate
*Terebratella Tepperi*—Tate
„ *Woodsii*—Tate
*Rhynchonella squamosa*—Hutton.

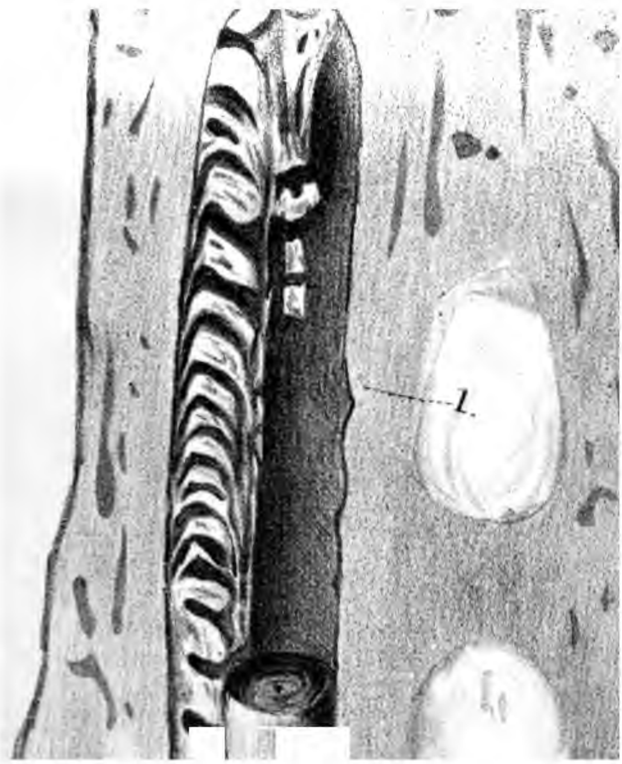
Those marked (?) are determined from imperfect specimens and require verification.

The result of these re-determinations, taken together with those referred to in Professor Tate's communication, leave only two out of nearly 300 known species in the Table Cape

Soc. of Tas.) since I made use of
before the members of this Soc
lessening of the per-centage of living
knowledge increases is most signific
principle which has been adopted by
him by nearly all English geologists,
living representatives indicate rathe
*miocene* age for our marine beds at Ta
tigations carried on by Professor Tate
workers, since that time, have placed
reasonable doubt, and now there is e
that the Table Cape beds, with their
mark the earliest dawn of the eocen
In conclusion, I may venture to prop
the gap between the cretaceous r
Queensland, and the eocene beds of Ta
is not far distant when passage beds
necting these systems more closely toge
merging the one insensibly into the oth

## DISCOVERY OF ENTOMOSTRAC MEMBERS OF THE TRAVERTIN AND A DESCRIPTION OF A CYPRIS.

UM


L.

Specimens of this freshwater entomostracan were collected by me some two or three years ago in abundance at Geilston. It is an interesting form, as it affords us valuable information regarding the condition under which opal-like rock was formed prior to the peculiar change in its structure.

## DISCOVERY OF A CONE, PROBABLY OF A SPECIES OF LEPIDOSTROBUS, IN THE SANDSTONES OF CAMPANIA.

By Robt. M. Johnston, F.L.S., Etc.

[*Read June* 13, 1882 *; accidentally omitted from Proceedings of the year* 1882.]

The very interesting impression in the block of sandstone appears to be the remains of a narrow, oblong, cylindrical strobilus, or cone, of a species of *Lepidostrobus*. It measures about 4¼ inches long and ⅞ inch in diameter. The strobilus agrees with general characters of the genus *Lepidostrobus*, having a central axis throughout its whole length, which is longitudinally striated, from whence radiate upwards and outwards narrow chambers, which evidently contained the sporangia. These chambers narrow and bend downwards abruptly towards the outer edge, where, if a section could be seen, it would, no doubt, show an imbricated appearance. So far as I can learn this is the first strobilus or fruit of a form of Lepidodendron discovered in Australia. Associated with the fruit, in a layer of shale, I discovered impressions of numerous microscopic wing-like seedlets, some of which I have magnified; these latter are frequently depressed near the centre and are almost invariably concentrically striated Impressions of *Zeugophyllites* are also abundant in the shales associated with the sandstone, which I believe to be of the same horizon as the Jerusalem coal. I propose for this fruit the name of *Lepidostrobus Muelleri*, in honour of Baron von Müeller, K.C.M.G., F.R.S., etc. (See Figure.)

obtained is broken away ; however, its stron
*P. ebeninium* will justify the congeneric r
*P. ebeninium*, the last whorl of the fossil is di
is a posterior groove within the aperture.

Spire acute, apical angle about 30°, of upw
tened whorls ; body whorl, with the outer lip
ing. Surface ornamented with about 10 flat re
spiral ribs, crossed by obsolete obtuse sigmo
the anterior half with large subacute nodul
on the penultimate whorl; on the posteri
nodulations are replaced by transverse ridge
ribs are about as wide as the interspaces, in eac
is a thread. The last whorl has an asymet
nodulation above the columella and anterior t
the space between it and the posterior angle of
without tubercles as in *P. ebeninium*. The in
thickened and reflected on the columella.

*Length*, less that of the canal, 85; *breadth* o
millimetres.

*Locality*.—Table Cape. R. M. Johnston *(on*
This species differs from the living *P. e*
relatively much greater width, in the nodulatio
anterior half of the whorl instead of medial, an
spiral ornament.

### POTAMIDES SEMICOSTATUM.

Spire acute, apical angle about 15°, of upwards
whorls; body whorl, with outer lip not or only slig
Surface ornamented with 10 or 12 spiral thre

### TORCULA MURRAYANA

Spire acute, apical angle about 15°, of upwards of 12 flattish whorls, medially depressed and acutely elevated at about the anterior fourth; suture distinct, thread-like, or somewhat grooved. Surface ornamented by about 24 spiral threads with or without smaller intermediary ones, crossed by close-set sigmoid striæ, the latter on the anterior whorls thinly squamose. Last whorl bluntly truncated on the periphery; base with spiral threads and transverse striæ as on the upper part of the whorl. Aperture quadrately-oval, continuous; outer lip with a deepish subtriangular median sinus.

*Total length*, 60; *breadth* of last whorl, 17; *height* of last whorl, 12 millimetres.

The species varies in the shape of its whorls, from flat or slightly concave to somewhat quadrate, and corresponding thereto in the depth of the suture; the keel-like elevation is sometimes obsolete, but the median depression is always present.

*Localities.*—Table Cape. R. M. Johnston (*six exs.*). Very abundant in the middle and lower beds of the River Murray Cliffs from Overland Corner to Blanchetown; also at Muddy Creek, Corio Bay, and Schnapper Point (R.T.).

The Table Cape specimens have flattish or slightly concave whorls with or without the anterior keel, and fall within the limits of variation exhibited by the Murray examples, though they are usually broader in proportion the apical angle being as much as 18°.

### TURRITELLA TRISTIRA.

Shell acuminately turreted; apical angle about 15° of upwards of 12 slightly convex whorls; suture linear. Surface ornamented with three conspicuous, spiral, acute ribs, and spiral and transverse striæ; the sulci on each side of the central rib are of equal breadth, but the anterior rib is separated from the suture by a distance less than that which separates one rib from the next, whilst the posterior rib is separated from its corresponding suture by a distance greater than the breadth of the medial sulci. Last whorl truncately angular at the periphery; base spirally ribbed and striated. Aperture quadrate; outer lip imperfect.

*Length*, 45; *breadth*, 12 millimetres.

*Locality.*—Table Cape. R. M. Johnston (*one example*).

This species is distinct from the few living species, which are conspicuously three-ribbed, by shape, ornament, and the unsymmetrical position of the revolving keels.

### LEIOSTRACA JOHNSTONIANA.

*Syn.*—Eulimella subulata, Tenison-Woods (*non* Mont.).

This species has been confounded by the Woods with the recent *L. subulata* of Wester which it differs in shape and suture; but relative in *L. acutissima*, Sowerby, living Eastern and South-Eastern Australia. It d species by its smaller size and slender p *acutissima* with 12 whorls has a length of breadth of 3 mm.; whilst *L. Johnstoniana* wit a length of 9·0 mm. by a breadth of 1·5 mm.

### CYLICHNA WOODSII.

*Syn.*—C. arachis. Tenison-Woods (*non* Qu

Shell solid, elongately ovate, imperforate; r sulcated, the intervening ridges flat and much versely ornamented with very fine close-set li the appearance of punctures within the sul forated; aperture narrow above, wider in f thin, simple; columella thick, slightly exp twisted and abruptly truncate in front.

*Length*, 13·5; *breadth*, 5·5 millimetres.

The above definition is drawn from a Table identical with that which Tenison-Woods r living species *C. arachis* of Quoy. *C. Woodsii* d in its more ovate outline, in its aperture and or its truncated columella. The material at my sufficient to warrant its generic separation whi by the truncated columella.

### CHAMOSTREA CRASSA

tinguished by the great thickness of the test, the convexity of the valve and the crenulation of the pallial line—characters sufficiently striking to warrant specific appellation. The outline of the fossil shell falls within the limits of variation exhibited by the living species, and the external ornamentation is same.

### CORBULA EPHAMILLA.

Shell solid, very inequivalve, inequilateral, ovately-triangular, rounded anteriorly, beaked posteriorly. Right valve with more than 20 very thick, rounded prominent concentric ridges, the whole surface striated concentrically. The ventral margin is outward-curved medially, and the ridges have a corresponding flexure. The posterior margin is obliquely truncated, carinated from the umbo to the post-ventral margin; posterior to the carina is a somewhat concave area on which the concentric folds are continued as multiplied lamellæ. The umbo is in the anterior third, flat, incurved, and with small ridges. Left valve ovately triangular, nearly flat, pointed behind, carinated from the umbo to the post-ventral margin; surface irregularly striated by lines of growth. Umbo flattish, from below which two distinct ridges radiate to the ventral margin, one or two additional but shorter ones sometimes occur. Right valve with an anterior pointed tooth; left valve with a stout posterior tooth, flattened and sulcated on its upper surface. Pallial sinus indistinct.

*Length*, 21; *breadth*, 16; *thickness* through both valves, 10 millimetres.

*Localities.*—Table Cape. R. M. Johnston. Abundant in the calciferous sand-rock of the River Murray Cliffs, near Morgan, and in the cotemporaneous deposits at Muddy Creek. (R.T.)

From the living *C. sulcata*, Lamarck, to which it has been referred, our fossil species differs in being less inequilateral, more pointed posteriorly, less gibbous, etc. A nearer ally among existing species is *C. fortisulcata*, E. Smith, from which it differs particularly in its truncated posterior margin.

### LUCINA PLANATELLA.

Left valve orbicular-ovate, equivalve, moderately thin, nearly flat. Surface ornamented with regularly disposed, concentric, erect, lamelliform ridges of growth, crossed by equidistant radial threads, producing on the dorsal-half an open reticulated appearance; towards the front the concentric ridges are coarser and the descending striæ finer and nearly obsolete. Umbo depressed, acute; interior margin smooth.

*Length*, 33; *breadth*, 31 millimetres.

The fossil has no close ally among living congeners.

Lunule cordate, not much impressed under indistinctly margined. Umbo is in the ant incurved and directed forwards. Inner ma excepting that of the post-dorsal region, is lated. Posterior cardinal tooth in left valve bituberculated on the crown.

*Greatest length*, 65; *greatest breadth* at behind the umbo, 57; *thickness*, 48 millimetre

*Locality.*—Table Cape. R. M. Johnston

*C. hormophora* has a closely allied species in at Muddy Creek, and near Morgan, which I n

### CHIONE (TIMOCLEA) DIMORPHOPH

Which differs in its more regularly rounde in the less inflated and more posteriorly place more impressed and concave lunule, and i different dimensions.

*Length*, 58; *breadth*, 45; *thickness*, 32 milli

### LIMA JEFFREYSIANA.

*Syn.*—*Lima subauriculata*, Tenison-Woods Species dedicated to Mr. Gwyn Jeffreys, F.R. conchologist, in acknowledgment of his assistan ration.

Shell thin, elongate-ovate with nearly strai equilateral by the slight obliquity of the hinge Surface ornamented with distant, acute, longit close-set, undulate, concentric striæ; the ray spicuous on the middle and anterior parts, bu

*L. subauriculata* and *L. elliptica* differ from *L. Jeffreysiana* by their ribs, smooth sides, medial furrows, and more inflated umbos. Among recent Australian shells the fossil species approaches *L. Strangei*, from which it differs by its straighter sides, by its more numerous and acute ribs, and by being more ventricose.

The majority of the new species have considerable analogy with recent congeners; but especial interest attaches to the existence in a fossil state of the genus *Chamostrea*, hitherto represented by a single species proper to South-eastern and Southern Australia and to Tasmania. The presence of *Potamides* is also noteworthy; one of the fossil species is much larger than any known recent form. A few Table Cape species, in my hands, await elaboration; but as it is imperative that the fossils should be studied in comparison with living forms, it is obvious, unless the necessary material be readily available, that an immediate and satisfactory answer cannot be given to the question:—Which of them are now known to be living, and which of them are supposed to be extinct?

I shall be happy to work out any material, that the Society or other possessors of Table Cape fossils may entrust to me, and I may add that my very rich collection of tertiary fossils enables me to institute a comparison of the Tasmanian fossils with those from continental and other localities.

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## DESCRIPTION OF A NEW SPECIES OF ODAX.

By Robt. M. Johnston, F.L.S., Etc.

[*Read July* 7, 1884.]

The following is a description of a new species of Odax, caught in the waters of the Derwent, and presented to me by Captain Beddome.

### Odax Beddomei (*Nov. sp.*).

$D\frac{20}{12}$, $A\frac{2}{9}$, P12-14.
L. lat. 40. L. tr. $\frac{3}{8\text{-}9}$.

Body elongate. Praeoperculum entire. Snout much produced and finely pointed. Eye rather large. Height of body one-tenth of the total length, and length of head contained in the latter three and one-third times. Upper posterior margin of operculum produced into a flaccid membrane having a rayed appearance. Colour of body and fins reddish, becoming lighter below lateral line. There is a singular well marked black elongate streak, margined with a scarcely perceptible yellow border extending over five of the upper rays of caudal fin, which latter is somewhat rounded terminally.

| | | |
|---|---|---|
| Total length ... ... ... ... ... | $4\frac{3}{4}$ | inches |
| Length of body ... ... ... ... ... | 4 | „ |
| „ „ head ... ... ... ... ... | $1\frac{1}{3}$ | „ |
| „ „ snout ... ... ... ... ... | $\frac{5}{12}$ | „ |
| Dia. of eye ... ... ... ... ... | 6 | mil. |
| Greatest depth of body... ... ... ... | $\frac{11}{24}$ | inches |
| Least „ „ ... ... ... ... | $\frac{1}{4}$ | „ |

## DESCRIPTION OF A NEW FOSSIL SHELL FROM THE EOCENE BEDS, TABLE CAPE.

By Robt. M. Johnston, F.L.S., Etc.

[*Read July* 7, 1884.]

### Genus Crepidula (*Lam.*)

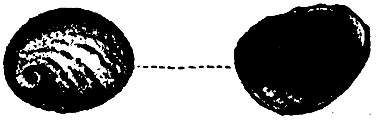
Shell oval, limpet-like, with a posterior oblique, marginal apex; interior polished, with a shelly partition covering its posterior half. They are sedentary on stones and shells, in shallow water, and are sometimes found adhering to one another in groups of many successive generations. The specimens which live inside empty spiral shells are very thin, nearly flat, and colourless. *Distribution.*—West Indies, Honduras, Mediterranean, West Africa, Cape, India, Australia, West America. *Fossil.*—Eocene. France, North America, and Patagonia. (Woodward's Manual of Mollusca, p. 277.)

### Crepidula umbilicata (*Nov. sp.*).

Shell somewhat roundly ovate, convex above, with nucleus submarginal and exserted. Whorls, three, rapidly increasing. Upper surface somewhat rugose, with three or four fine spiral ridges, which are here and there interrupted, the whole crossed with fine lines of growth. The internal ledge, occupying nearly the posterior half of shell, is concave with a somewhat wide and profound umbilicus; aperture deltoid; labrum thin, and obtusely angled anteriorly.

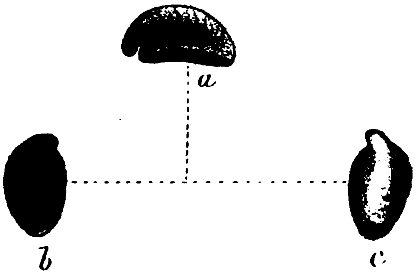
Length, 8 lines; breadth, 7 lines; depth, $3\frac{1}{2}$ lines.

Only one example from the eocene beds, Table Cape, associated with one or two species of the same genus not yet described.



*Crepidula umbilicata* Johnston.

Fossil, Eocene Beds, Table Cape.



*Crepidula Hainsworthii* JOHNS

# DESCRIPTION OF A NEW SPECIES OF CREPIDULA FROM THE EOCENE BEDS, TABLE CAPE.

BY ROBT. M. JOHNSTON, F.L.S., ETC.

[*Read August* 11*th*, 1884.]

In addition to the three representatives of the family *Calyptraeidae* already described from the Table Cape beds, viz:—*Infundibulum calyptraeformis*, Desh. *Crepidula turbinata*, Woods, and *C. umbilicata*, Johnston, I have now the pleasure to announce the existence of a fourth species of this interesting family from the same formation. The following is a description giving the specific characters of the new form:—

*Crepidula Hainsworthii*, NOV. SP.

Shell, thin, ovate, narrowly and abruptly arched laterally, and gently rounded longitudinally, dorsal surface finely striated with lines of growth; whorls one and a half rapidly and laxly expanding; nucleus minute, of one turn, exserted on posterior margin, slightly beaked and incurved. Inner shelf concave, transversely striate, deeply sunk and partly dividing the cavity leading to exserted nucleus; the shelf scarcely occupies one-third of the posterior part of the shell. Aperture narrowly ovate.

Length, 14mil.; breadth, 8mil.; height, 5½mil.

The younger examples differ very much in appearance from the mature form, being relatively shallower and scarcely beaked.

I have much pleasure in associating this shell with the name of Mr. Thomas Hainsworth, of Latrobe, who has largely contributed to our knowledge of the geology of the North-West Coast of Tasmania.

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# NOTES ON THE DISCOVERY OF TWO RARE SPECIES OF FERNS, NEW TO TASMANIA.

BY ROBT. M. JOHNSTON, F.L.S., ETC.

[*Read August* 11, 1884.]

Thanks to the distinguished labours of Robt. Brown, J. D. Hooker, Gunn, Stuart, and other naturalists, the extent and distribution of our Tasmanian ferns, in nearly all parts of the island, have been so thoroughly investigated that it would seem little now remains to be done. Still there are certain Alpine regions in the North-Western and in the extreme South of this island which, being densely covered with an

Lefroy of a new fern to Tasmania (*Aspidium his* Swartz) in the neighbourhood of Mount Heemskirl fern, prior to Mr. Lefroy's discovery, was suppos confined to the Cape Otway Ranges, Victoria, and Zealand, and its existence in Tasmania was of great b interest. And recently, through the instrumentalit T. B. Moore, who is at present surveying tracks neighbourhood of the Queen's River and Huxley Ra the West Coast, I have obtained several interesting ge and botanical novelties. Mr. Moore's praiseworthy tions and example might be followed with advan science by all surveyors and other persons who have opportunities in new districts; for among the sp submitted to me by Mr. Moore were two remarkable of ferns which I at once recognised were new to Ta One of them upon diagnosis I determined to be t *Hymenophyllum marginatum* (Hook and Grev.), one smallest of the filmy ferns, hitherto only know localities in the neighbourhood of Port Jackson, New Wales. The other was so novel and so densely covere sides with a coating of tomentum that I could not assign its position, no *sori* being visible on any of the examined by me. I immediately submitted the two to our illustrious honorary member—Baron Von M who was extremely interested in the discovery. He wrote to me confirming the correctness of my determ as regards *H. marginatum*, and on subsequent refer his type specimens as regards the other he afterward me to the following effect:—"I have carefully exami that yet much remains to be done for perfecting the elucidation of the flora there. I hope that particularly the North-Western regions will be well searched this season." Mr. Moore may well be complimented for these two interesting discoveries, and I hope they will encourage him to still farther prosecute his meritorious observations in that interesting part of the island. Tasmania has only one species of fern peculiar to the island, the remainiug fifty-two species are common to one or other of the Australian colonies. Queensland and New Zealand possess by far the largest number of species. Out of the 201 species of ferns found in Australia and Tasmania, only 53 of them, or about one-fourth, are as yet known to exist in Tasmania. This is a small proportion when we recognise what peculiarly favourable conditions exist in this island for the growth of this most interesting order of plants.

The following is a description of the two species referred to :—

*Hymenophyllum marginatum* (Hook and Grev.), p. 705, Flora Austral., vol. vii. ; p. 57, Hook and Bak., syn.

Fronds on short filiform stipes, $\frac{1}{2}$ to 1 inch long ; linear and entire, or once or twice forked, with a central nerve and nerve-like margins not toothed. Sori solitary and terminal. Indusium about $\frac{1}{2}$ line long and broad, divided nearly to the base into obovoid-orbicular valves.

On mossy rocks and on trunks of honeysuckle.

Honeysuckle Hill, Queen River, Tas., T. B. Moore ; Port Jackson, N.S.W.

*Hymenophyllum malingii*, Mett. ; *Trichomanes malingii*, Hook, p. 66. Hook and Bak., syn.

Stipes 1-3 in l., slender, naked ; fronds pendent 4-6 in l., 1-1$\frac{1}{2}$ br., linear-oblong, bi-or tri-piunatifid ; main rachis densely clothed with close tomentum, free throughout ; pinnæ $\frac{1}{2}$-$\frac{3}{4}$ long, oblong or ovato-rhomboidal, cut down to a rounded rachis ; pinnules deeply flabellately and sub-pinnatifidly cut ; ultimate segments linear-filiform, 1-3 long ; the substance coriaceous and soft with a dense coating of tomentum, a single vein only in each segment ; sori 2 to 12 to a pinnæ terminal on the segments ; involucre divided about half-way down ; valves denticulate at the apex, and shaggy like the frond.

Honeysuckle Hill, Queen River, Tas., T. B. Moore. New Zealand.

[illegible] magnetic, and secular disturbances, have again and again attrac attention of many skilled observers; and while it is g admitted that the limits of time and space withi records of such matters have been carefully tabulated yet, too circumscribed to throw light upon many an it is almost conclusive that the movements of the la the planets, notably Jupiter, exercise a very powerful i mediately or immediately upon the several matters to. In the March number of the journal of the St Society of London for 1879, there is an interesting p Mr. B. G. Jenkins, F.R.A.S., in which it is attempted shown that there is a probable connection between the death-rate of England and the position of the planet in his orbit. He states that on representing by diagr deaths in England for the last thirty-nine years he wa little surprised to find, as he had already expected, th was a marked difference in the number of deaths e years; in the majority of cases a low death-rate bei ceeded by a very high one. On mapping out the cu Jupiter's course for the last thirty-nine years ending i he found, so far as England was concerned, that the pe and aphelion of Jupiter corresponded in a very rema manner with the periods of low death-rate occurring years 1839, 1845, 1851, 1856, 1862, 1868, and 1874, accordingly, from his observation, predicted for Engl the year 1880 a lower death-rate than during any period in the history of that country.

Although this prediction was not verified exactly as 1880 it is somewhat interesting to note that in the tw

On the other hand if we turn to the colonies of Australasia it will be found that there is such a close agreement with each other in the general rise and fall of their respective death rates during the last 25 years that it is not easily accounted for unless it be referred to some super-terrestrial influence of a variable character, which has the effect of intensifying or modifying the death-rate to such an extent that the local causes appear as mere ripples on the swell of a great wave in conjunction with it. Such is the effect of the minor variations of local death-rates that the significance of this common rise and fall can only be fully appreciated when shown in a diagraphical form as in the accompanying plate. It is remarkable to observe how closely the maxima of death-rate agree with Jupiter's movement from aphelion to perihelion, and with the minima of sunspots; and conversely it is still more surprising to find a corresponding agreement between the minima of the death-rate in the four colonies, viz:—Tasmania, Victoria, New South Wales, and South Australia, the maxima of sunspots, and the movement of Jupiter from perihelion to aphelion. Surely such a widely based agreement cannot be a mere coincidence; and although it must be confessed that if we take the death-rates of the thirteen principal countries of Europe separately, the results are often conflicting or anomalous, yet it is significant that the mean of all these for the period 1861 to 1882 corresponds in a remarkable way with the movements forming the curves of periodic minima and maxima of the mean of the death-rates of the various colonies of Australasia.

Should the same curve maintain its regular course it would appear probable that the death-rate in Australasia would attain its next maximum period about the years 1885 to 1887.

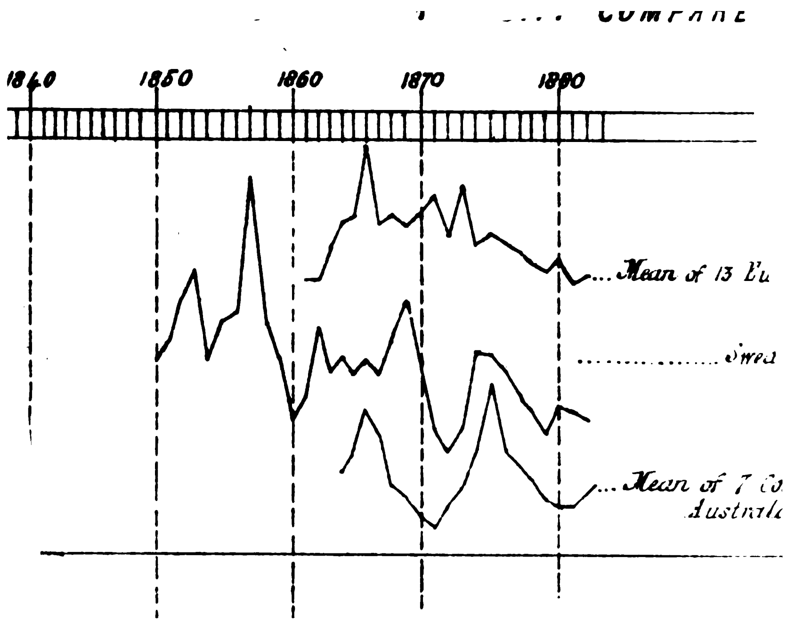
Still, notwithstanding the confidence with which Wolf, Sabine, Balfour Stewart, Meldrum, and other eminent investigators maintain the coincidence of the periodicity of solar and other terrestrial phenomena, it is clear that the death-rate coincidences are not sufficiently broad and regular to justify prediction, although there is a presumption in favour of a relatively low death-rate in Australasia during years of sunspot maxima, and a more or less relatively high death-rate during years of sunspot minima. Although the several thinly populated Australian colonies are as widely separate as the various States of Europe, it is interesting to observe how much more closely the rise and fall of the death-rates of the former correspond to each other, than do the death-rates of the densely populated States of Europe.

It is also noteworthy that the mean death-rate of the Colonies of Australia, for the last twenty years, is lower than the mean death-rate of Europe by about 10 per 1,000 persons death-rate of Australasia a more sensitive index super-terrestrial influences.

These observations together with the accompan it is hoped, will serve to excite greater interest in ant subject. I desire in conclusion to repeat that the coincidences pointed out by me are more sugg conclusive as regards the relations commented upo not ventured to tabulate the death-rate of Austr to 1864, as, owing to the absence of proper record tion, the estimates of population during the earlie not trustworthy. There is sufficient evidence l conclude that in the years 1853-1856 the dea Tasmania and Victoria, at least, were unusually l period also corresponds with the position of Jup orbit between perihelion and aphelion, and als minimum sunspot period.

Doubtless there are other complex relations whi the question under consideration, but the independ vations now carried on in all parts of the world by skilled investigators will sooner or later enable us stand them more thoroughly than we do at the pre

Comparative table showing the suggested c between the death-rate and certain super-terrestr mena :—


COMPARI
1840
1850
1860
1870
1880
Mean of 13 Eu
Swed
Mean of 7 Co
Australa

## ANNUAL DEATH-RATE OF VARIOUS COUNTRIES.

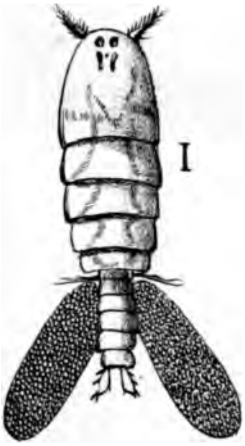
| | Europe. | | Australasia. | | | | | | | Mean of Thirteen Principal States of Europe. | Mean of the Seven Colonies of Australasia. | Sun Spot Numbers (Wolf's). | Relative position of Jupiter in his orbit. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | England. | Sweden. | Victoria. | New South Wales. | South Australia. | Queensland. | Western Australia. | New Zealand. | Tasmania. | | | | *A* Aphelion.<br>*P* Perihelion. |
| 1804 | .. | ... | ... | .. | ... | ... | ... | .. | ... | ... | ... | 73·1* | — |
| 1810 | ... | .. | ... | ... | .. | ... | .. | .. | ... | ... | ... | 0·0† | — |
| 1816 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 46·4* | — |
| 1823 | ... | .. | ... | .. | ... | .. | .. | ... | ... | ... | .. | 1·8† | — |
| 1830 | ... | .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | 70·7* | — |
| 1833 | ... | ... | ... | .. | .. | ... | .. | ... | .. | .. | ... | 8·5† | — |
| 1837 | ... | ... | ... | .. | ... | .. | ... | ... | ... | ... | .. | 138·2* | — |
| 1839 | 21·8 | ... | ... | ... | ... | ... | ... | .. | .. | .. | ... | ... | *A* |
| 1843 | 21·2 | .. | ... | ... | ... | .. | .. | ... | ... | ... | .. | 10·7† | — |
| 1845 | 20·9 | ... | .. | ... | ... | ... | ... | .. | .. | .. | ... | ... | *P* |
| 1848 | 24·7 | ... | .. | .. | ... | .. | .. | ... | .. | ... | ... | 124·3* | — |
| 1851 | 22·0 | 20·8 | .. | ... | ... | .. | ... | ... | .. | .. | ... | .. | *A* |
| 1853 | 22·9 | 23·7 | ... | .. | .. | ... | ... | ... | .. | ... | ... | ... | — |
| 1856 | 20·5 | 21·8 | ... | ... | ... | ... | ... | .. | 17·80 | ... | .. | 4·3† | *P* |
| 1857 | 21·8 | 23.7 | ... | ... | ... | .. | ... | ... | 17·10 | ... | .. | ... | — |
| 1860 | 21·2 | 17·6 | ... | ... | .. | ... | ... | ... | 19·92 | ... | ... | 95·7* | — |
| 1861 | 21·6 | 18·5 | .. | .. | .. | ... | ... | .. | 16·36 | 23·4 | ... | 77·2 | — |
| 1862 | 21·4 | 21·4 | ... | ... | ... | ... | ... | .. | 15·01 | 23·1 | ... | 59·1 | *A* |
| 1863 | 23·0 | 19·3 | ... | .. | .. | .. | .. | ... | 15·49 | 24·4 | ... | 44·0 | — |
| 1864 | 23·7 | 20·2 | ... | .. | .. | ... | ... | ... | 15·34 | 25·5 | ... | 46·9 | — |
| 1865 | 23·2 | 19·4 | 16·97 | 16·41 | 14·30 | 21·42 | .. | 15·13 | 13·40 | 26·0 | 16·3 | 30·5 | — |
| 1866 | 23·4 | 20·0 | 19·37 | 17·47 | 17·20 | 25·67 | .. | 12·86 | 14·19 | 28·8 * | 17·7* | 16·3 | — |
| 1867 | 21·7 | 19·6 | 18·06 | 19·64 | 17·48 | 17·80 | ... | 12·78 | 14·44 | 25·5 | 16·7 | 7·3† | — |
| 1868 | 21·8 | 21·0 | 15·00 | 15·83 | 14·41 | 17·36 | ... | 11·94 | 14·75 | 25·9 | 14·9 | 37·3 | *P* |
| 1869 | 22·3 | 22·3 | 15·47 | 14·05 | 12·37 | 16·20 | .. | 11·73 | 13·24 | 25·4 † | 13·8 | 73·9 | — |
| 1870 | 22·9 | 19·8 | 14·61 | 13·27 | 13·94 | 14·59 | ... | 11·13 | 14·08 | 26·1 | 13·6 | 139·1* | — |
| 1871 | 22·6 | 17·2 | 13·46 | 12·54 | 12·87 | 14·83 | ... | 10·13 | 13·46 | 27·0 | 12·9† | 111·2 | — |
| 1872 | 21·3 | 16·3 | 14·38 | 14·11 | 15·33 | 14·97 | 14·02 | 11·68 | 13·83 | 25·4 | 14·0 | 101·7 | — |
| 1873 | 21·0 | 17·2 | 15·02 | 13·84 | 13·48 | 16·06 | 16·24 | 12·67 | 14·60 | 27·4 * | 14·6 | 66·3 | — |
| 1874 | 22·2 | 20·3 | 15·72 | 15·12 | 17·05 | 17·98 | 18·74 | 13·05 | 16·22 | 25·0 | 16·3 | 44·6 | *A* |
| 1875 | 22·7 | 20·2 | 19·42 | 18·09 | 19·45 | 23·80 | 17·88 | 15·92 | 20·01 | 25·4 | 19·2* | 17·1 | — |
| 1876 | 20·9 | 19·5 | 17·02 | 18·11 | 16·28 | 18·82 | 14·18 | 12·66 | 16·57 | 24·3 | 16·2 | 11·3 | — |
| 1877 | 20·3 | 18·5 | 15·80 | 15·28 | 13·99 | 17·29 | 15·70 | 11·47 | 19·19 | 23·9 | 15·5 | 12·3 | — |
| 1878 | 21·6 | 18·0 | 15·46 | 15·88 | 15·44 | 20·41 | 14·07 | 11·01 | 15·67 | 24·2 | 15·4 | 3·4 | — |
| 1879 | 20·7 | 16·9 | 14·53 | 14·29 | 14·09 | 14·97 | 14·46 | 12·46 | 15·18 | 23·7 | 14·3 | 6·0 | — |
| 1880 | 20·6 | 18·1 | 13·70 | 15·57 | 14·85 | 13·59 | 13·24 | 11·46 | 16·12 | 24·29 | 14·0† | 32·3 | *P* |
| 1881 | 18·9 | 17·7 | 14·16 | 15·12 | 14·49 | 15·02 | 13·80 | 11·13 | 14·77 | 23·30† | 14·0† | 54·2 | — |
| 1882 | 19·6 | 17·4 | 15·31 | 16·03 | 15·15 | 17·99 | 14·16 | 11·19 | 15·82 | 23·51 | 15·2 | .. | — |
| 1883 | .. | ... | ... | .. | ... | ... | .. | ... | 17·06 | ... | ... | ... | — |

*** Maximum period. † Minimum period.**

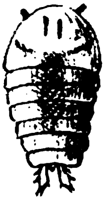
When I captured these animals I was a pass
board the ship Invercargill, Captain John Muir, t
voyage from London to Port Chalmers, N.Z. At
January 26, 1883, the ship's position was 40° 38′ S.
30′ E., and from the following day's run and position
late we were in 40° 40′ S., and 17° 35′ E., at the tin
obtained these specimens. The day was dull, but
and the temperature of the sea, as taken by the n
higher than on preceding days. Unfortunately, I
make a note of the exact temperature, but I imagine
passing through one of those patches of warmer wa
have been remarked to the southward of the Cape
Hope. Nothing unusual was noticed in the appea
the sea, which was calm, until the afternoon, when t
was filled with brilliant blue stars, floating past th
great numbers. With a small canvas bag I succ
fishing up several of the blue stars, which were a s
*Sapphirina*, and two or three other animals, non-l
one of which was a *Salpa democratica*. I kept them i
of sea water till the 29th, when an unfortunate accide
them, and having only a small magnifying glass, I v
vented from making a full examination of all. I p
the sketches I was able to make, and through the kin
Mr. Morton, of the Royal Society's Museum, I la
ceived from Mr. Haswell, of Sydney, information as
species and construction of the animals depicted.

The two small crustaceans correspond so closely
descriptions and drawings of the male and female of
*rina gemma*, as given by J. D. Dana ("Crustacea," P

♀



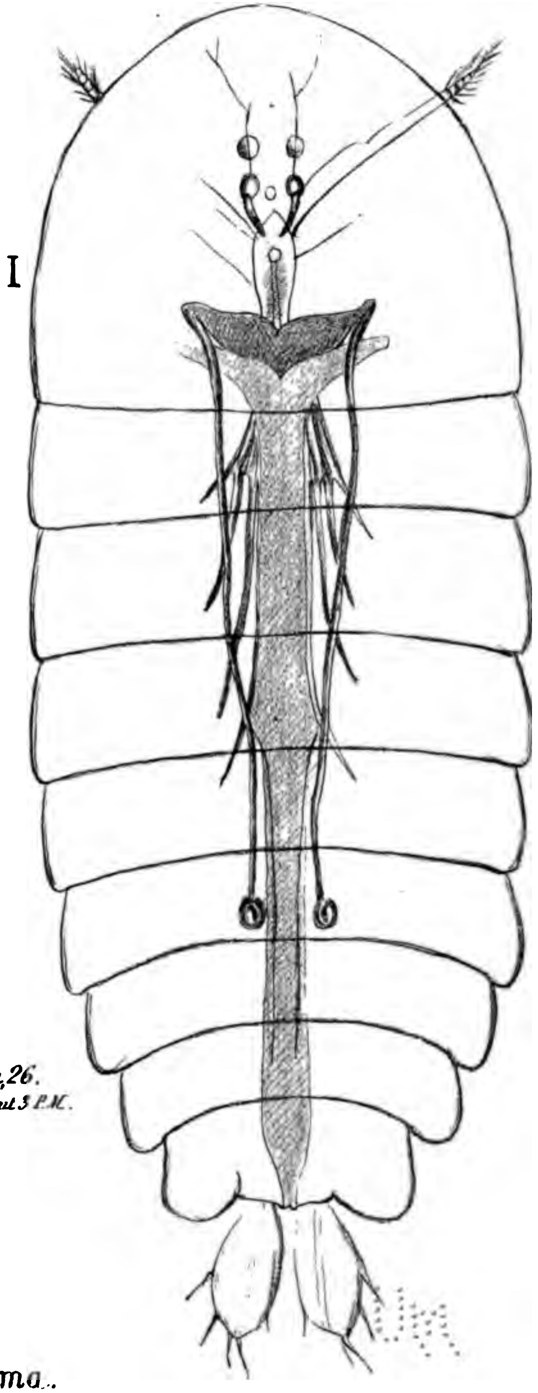
*Natural Size x 8.*



*Natl. Size x 8.*

**Sapphirinae** *Caught 1883, Jan. 26.*
*In 40° 40′ S. & 17° 35′ E. about 3 P.M.*

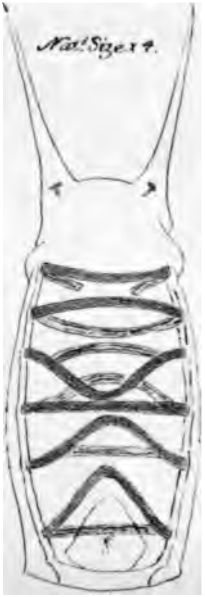
♂



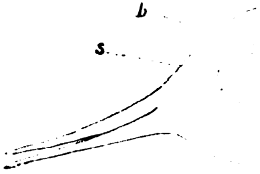
Sapphirina Gemma.

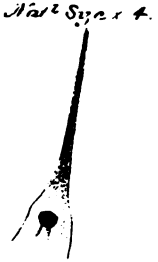
MU

ral Size
x 1/4 In.



Muscular System





One of the
Posterior Processes.

S: Demo
1/140"

an inch broad, and its body is composed of ten segments, the last being almost absorbed in the ninth, which again is much smaller than the eighth. Its activity was remarkable, and its motion sinuous, like that of the Sole. The female is about $\frac{1}{8}$ of an inch long, and $\frac{1}{24}$ of an inch broad; its cephalothorax has five joints, and its abdomen six. On either side of the abdomen, and springing from the junction of abdomen and thorax is a bag of very numerous small eggs, about $\frac{1}{24}$ of an inch long, and $\frac{1}{60}$ of an inch broad, of an elongated egg-shape. The female, like the male, was extremely nimble and active, and swam swiftly round and round the glass. The eggsacs, while the animal was in motion, were made to rapidly approach and recede from one another, thus appearing more like organs of locomotion. Both sexes appeared to me to have a finely granulated exterior, and a uniform dull lavender colour. In the head of each were a pair of elongated bronze red specks, the eyes according to Dana.

The other animal which I examined was one of those very curious Tunicates, the *Salpae democraticae.* This Salpa, Mr. Haswell writes me, "develops no sexual glands, but give origin by budding to a chain of young"—*Salpae mucronatae*—each differing considerably from *Salpa democratica.* These remain, through life, united in a chain, and "each when adult develops a single egg from which a *Salpa democratica* is developed." The solitary Salpa which I had the good fortune to capture, contained, when caught, a chain of young which were distinctly visible through the transparent body of the Salpa, curled round at the posterior end of the internal cavity. Next morning, when daylight permitted a more detailed examination. I found the chain of 80-90 minute *S. micronatae* just escaping from the *S. democratica*, the last pair of the chain becoming detached a few moments after I got them under observation. This chain consisted of a double row of animals, so small that with my inferior magnifier I could only see them as egg-shaped transparent masses, about $\frac{1}{24}$ of an inch long, with a purple knob at one end and a purple streak in the interior. The chain was about $1\frac{2}{3}$ of an inch long, and floated with the purple knobs uppermost, in a curved shape, which varied as the individuals performed their occasional simultaneous contractions.

The *Salpa democratica* was about $\frac{1}{2}$ an inch long, or $\frac{3}{4}$ of an inch, if the tapering conical processes at the posterior end are included. Its breadth was about $\frac{1}{4}$ of an inch, and its shape that of a barrel, or square-ended egg. The tunic was perfectly transparent, and the whole animal colourless, except the main parts of the nervous system, which were of a beautiful purple, and a few spots of a similar purple, which were, I believe, parts of the digestive and reproductive organs. The

jump of about an inch. The sixth band, or ribbo
nearest the processes at the posterior end—did not co
encircle the body, but was interrupted for a space o
one-sixth of its length, on the dorsal side of the ani
that I mean the side which was generally uppermos
Salpa floated, and is opposite to that from which the p
processes spring. The fifth and fourth bands touched
dorsal side; the fourth, third, and second similarly lay
juxtaposition on the ventral side.

The water which is ejected by these muscular band
mitted by a wide orifice, with projecting thick lips,
in the middle of the anterior end of the Salpa, and th
were continually and regularly opening and shutting. I
to make a sketch of the orifice, but did not arrive at an e
tion of the posterior one, which lay somewhere about t
processes. Just behind the anterior orifice, and ma
angle of about 45° with the plane dividing the dor
ventral halves of the animal, was a roughly triangula
vein or thread, having in the centre of the space en
purple dot, with a few fine radiating purple lines.
according to Mr. Haswell's letter, are the nerve gangl
eye spot. From the centre of the base of the tri
nerve, and running along the dorsal side of the interna
of the Salpa is the endostyle, which is purple in colo
about $\frac{3}{10}$ of an inch in length, or $\frac{3}{8}$ of the length of the
body. From the apex of the triangular nerve is a
purple vessel, running in an irregular curve back to t
terior end of the animal. This is the main blood-ves
close to its further end lies the heart. The heart str
as very remarkable, and I spent some time in watch

The two posterior processes to which I have referred were apparently of the same substance as the outer tunic. They were broadly conical at the base, which was about $\frac{1}{3}$ of their total length; the outer $\frac{2}{3}$ were very much finer and narrower, and covered with minute dots, which, Mr. Haswell says, were probably minute spines. In the interior of the base of each was a very strange mushroom-shaped object, of which Mr. Haswell says he does not know its precise nature, though he knows it to be as I described in my letter to him. When I sketched the process, or horn, I noted the mushroom-shaped object as coloured metallic green, but if I recollect right it was of the same bright purple as the nerve ganglion, etc., when the animal was first caught.

I have not been able to find any detailed account of the Salpae in the Society's Library, but in the Proceedings of the Boston Society of Natural History, Vol. XI., p. 17, is a detailed description, with woodcuts, of *Salpa Cabotti*, by Alexr. Agassiz. This is found south of Cape Cod, and very closely resembles the one I caught, and the description and investigation into the connection of the chain forms are highly interesting.

## CANCER IN CATTLE.

[Paper read before the Royal Society of Tasmania August 11th 1884,

By H. A. Perkins M.D., Edin.]

The subject of disease in cattle is one which cannot fail to interest all sections of the community, as well the stockowner who provides for the market as the inhabitants of towns who consume the meat, and to whose advantage it must be to obtain the most wholesome supply of food. At a time when cancer among human beings has *been said to be on the increase, the nature of such disease among cattle not only merits attention at the hands of veterinary surgeons, but furnishes material for speculation to medical men. For in these days of minute organic life, of micrococci and bacilli, at a time when so many diseases find advocates for their origin and development in the theory of contagious living organisms, it might be a fair deduction to draw that the disease in man derived its prevalence and potency from living spores transmitted from the diseased meat which we colonists so unsparingly consume. The more especially as specimens of such disease called cancer in cattle areneither few nor hard to find, and the description of Osteo Sarcoma which I am about to give, is based on examples obtained in Tasmania. "The time has

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[*Statistics of last 14 years show that though there has been an increase in the number of deaths from this cause, yet that the population has increased in nearly the same ratio.]

the inner surface of the jaw. At first the skin moves the tumour, but in advanced stages it becomes adherent and is with some little difficulty removed or scraped, the parts be struck and inflammation ensue, ulcera skin takes place, exposing a raw surface, and at later s ings or fistulae are formed, leading to cavities within the the bone ; through these openings, a discharge of more is continually taking place. Eventually, great pain is f cation, and as the bones become further involved, the out, ultimately, if not slaughtered, the beast perishes haustion and emaciation. These tumours occupy mont years in their development, the soft tissues become chan dense mass of fibrous tissue, and the bone is conver porous-body, large cavities enclosing thin bony plates. obtain a section of the bone, removal of one or two tee sary, and then it will be seen at once on sawing throug that the appearances presented are very different fron healthy bone.

The specimens shown were one of the lower jaw, and superior maxilla, the disease in the last extending from and showing well the honey-combed appearance of the e In a healthy jaw, the boundary lines of compact or hard soft spongy bone are well marked. In the diseased bon spongy tissue at the root of the tooth, or in other words, is broken up and subdivided by numerous trabeculæ of l surround cavities containing a soft, red pulp ; the outer of bone is so expanded and invaded by these deposits, th marks of hard and soft are obliterated, and the substa bone is partitioned into divisions or islets of various s marrow and bone, or rather soft material and bone become intermixed. The effects of this disease may be seen in o and parts of the body. In the lungs soft circumscribed m ing in size from a pea to a mandarin orange may be seen.

in all probability resemble those of deposits found elsewhere. The muscular tissueadjacent to the diseased jaw, has been examined by me, but I failed to discover any indications of morbid deposit.

The brain and eye I have not yet had an opportunity of examining.

A microscopic demonstration of the diseased bone, may be obtained by cutting as fine a section of bone as possible with an ordinary saw, further obtaining a thinner section than the first by means of a fret saw machine, and lastly filing this down to an extreme degree of tenuity.

A section obtained in this way is seen under the microscope on the table together with a specimen of bone obtained from a healthy animal In the diseased or osteosarcomatous section, the lacunœ are enlarged and irregularly distributed in relation to the Haversian canals which are twisted and thrown across one another in different directions. It must be mentioned here that there are two sections of the bone one parallel with the ramus of the jaw and the other directly transverse, these different directons were taken with a view of showing the different relations of the lacunœ to the Haversian canals.

It is interesting in one of the morbid specimens to note the presence of triangular cells apparently occupying the mouth of the lacunœ, for these appearances are to be seen also in the soft green material of enlarged glands, where too may be seen ovoid cells with triple nuclei floating over the field in abundance.

The microscopic examination of the green material contained in one of the subperitoneal glands shewed numerous round cells containing two or three nuclei, the granular cell substance becoming clear on the addition of acetic acid, the appearances being identical with those of a section of tuberculous lung. Several large three-cornered cells containing nuclei were also noticed, and a dumb bell shaped cell like that of a crystal of oxalate of lime. The soft yellow matter from a secondary abscess in the jaw contained many thousands of round cells with multiple nuclei and all densely packed, showing activity of growth.

The cause of this disease has been attributed to a blow or to external violence. This cannot, however, be the real underlying cause, because in the first place where a blow is struck on healthy bone, the result, if any, would be ostitis or periostitis or simple inflammation of the bone, which after a while would subside, or would only leave behind some innocent thickening.

Some explanation of the choice of site for the manifestation of the disease, may be found in these considerations :—

1. The head and jaws of horned cattle are more exposed to injury than other portions of their bodies—obstacles being often brushed aside by the heads or horns of beasts, and danger first confronted by the same parts. Further, it is well-known that when the disease breaks out in the upper jaw, it very often arises from the fact that a briar or thorn has scratched the upper or lower eyelid, given rise to subsequent irritation—provoked an open sore—and developed into a scrofulous growth by the continued irritation and rubbing which the beast has sought to relieve itself with.

2. Again, just as in man, the favourite site of manifestation of scrofulous disease is in the hip, so in cattle, it is quite probable that

Again the microscopic appearances of the glands ad of the tumours in the lung and liver found in cases of o coincide with the appearances seen in the same orga animal is suffering from tuberculosis. Though I hav several specimens, I have not yet come upon cells which resemble those of cancer. Moreover tho' in advance osteo-sarcoma the soft parts are adherent to the bone, t general brawniness and adhesion of surrounding parts to met with in cases of confirmed cancer. The presence o particles in the deposit is just what we might expect tubercle though not often, if ever, seen in cases of cance

* Willows Report.

PARK'S CASES.

| Colour and Sex. | Age in years. | Time affected. | External manif disposed of. |
|---|---|---|---|
| No. 1.<br>Red cow. ... ... | 4 years. | unknown. | Osseous tumour on ribart. This w<br>ecimen of Bo |
| No. 2.<br>Red and white steer. | 6 years. | 2 years. | Tumour on both g's food. |
| No. 3.—Red steer.... | 4 years. | 4 months. | Small tumour on leg's food. |
| No. 4.<br>Red and white cow.. | 5 years. | 2 years. | Large tumour on left pigs. |
| No. 5.<br>Red and white steer. | 5 years. | 2 years. | Very large tumour on b<br>pigs. |
| No. 6.—Red steer.... | 5 years. | 3 years. | See No. ed. |
| No. 7.—Red steer.... | 5 years. | 2 years. | See No. 5 ars. |
| No. 8.—Red steer.... | 6 years. | 3 years. | Large tumour on le's food. |
| No. 9.—White bull.. | 3 years. | 1½ years. | Tumour on right<br>d. |
| No. 10.<br>Red steer. ... ... | aged. | about 2 years. | Both lower jaws<br>d. |
| No. 11.<br>Red steer. ... ... | aged. | 3 years. | Both jaws afwn. |
| No. 12.<br>White and red cow.. | 5 years. | unknown. | Right uppeHobart. |

One conclusion is very clear after reading the result of Mr Park's *post mortem* examination, and that is, that the larger the tumour on the jaw and the more ulcerated it is, the more extensively are the internal organs affected.

It is probable that the deposits in the internal organs are secondary deposits and that the primary seat of disease is in the jaw. But it is easy to obtain many specimens of tuberculosis in lungs and other organs, in animals in which there is no outward manifestation of the disease.

Mr. Willows, in his report on Tuberculosis, printed by the N.S.W. Government, is inclined to attribute the existence of this pest in rabbits to the prevalence of tuberculosis, and in a minor degree of osteosarcoma in Tasmanian cattle. It is conceivable that in rare instances rabbits may have ingested some tuberculous matter, voided from cattle ; but as rabbits are not carnivorous and living on succulent food, are not often seen to drink, this explanation does not appear to me to afford a sufficiently open channel for the dissemination of the virus.

It may be asked again, Whence did the cattle obtain their germs of the disease ? Is it not more likely that the rabbits in their turn infected the cattle. We know that the disease exists among kangaroo. It is impossible, I believe, to say which order of animals first infected the other. Rather do we know that both among men and animals the germs of scrofula exist in abundance, that the disease has been handed down from time immemorial, and, arising primarily we may surmise from a degeneration of healthy cells has been perpetuated by in-breeding, by over-feeding, and in some climates by the close confinement of cattle during the winter months, and that it is always ready to declare itself at certain critical periods in weakly animals, as for instance during the eruption of the molar teeth.

The evidence of Mr. Kendall, given before the Tuberculosis Board in Victoria is so important that I quote it in full from *Australasian*, Feb 1884, and will discuss some of his conclusions and recommendations. "Mr. Kendall considered the disease to be commonest among shorthorns. He had seen several cases of tuberculosis of brain and he differed from others, in considering ulceration of intestines to be comparatively common at least in calves, and in holding that the udder was affected in many cases. He saw little of this disease till about 3 years ago, but last year, 1883, he estimated that he had seen about 100 diseased animals living and dead. Had found it once in a native bear and in a baboon at the Zoo, but had not observed the disease in sheep, pigs, or rabbits. True cancer in cattle was rare, most supposed cases being really scrofulous diseases of the glands about the head and neck. The duration of the disease was very uncertain, and might be rapidly fatal or might last for years, an animal, perhaps, being fat even after a year. He thought the disease widely spread, and prevalent in the colony. The animals most frequently affected were Shorthorns and Ayrshires, and he lately saw a very marked case in an Ayrshire bull, which was being used for stud purposes. He considered that the scrofulous disease of glands was most common among animals of two to four years, while in calves the joints often were diseased. The disease called "foul" affecting the feet in old cattle, he considered to be he stated that in that case, animals had all been constantl and under decidedly unhealthy conditions. He had seen c pigs previously healthy injured by consuming the milk culous cows, even when supplied with other good food, and satisfied that they acquired tubercle. He was not of opin there was much risk of contagion when animals lived in t air, and had been puzzled to account for the prevalence of tl in this country where stock generally lived under natural co There was no connection between pleuro-pneumonia and t sis, other than the possible production of a predisposition." of opinion that the disease might sometimes be spread by in by mistake for pleuro-pneumonia by incompetent persons, known no cases. The chief cause of the prevalence of the this country he thought to be hereditary transmissio affected imported stock. He had not had much experienc dairy cows but had seen cases and thought the disease common in the Melbourne dairies from casual observation o feeding in the parks and other places. He has not se authenticated case of children injured by the use of mill adults from consuming tuberculous meat, but he had seen tul glands still attached to meat exposed for sale. As to precau be taken he would have dairies inspected and all diseas slaughtered, as he believed there was risk from using tl even when the udder was not affected. The sale of meat nee absolutely prohibited if the disease was slight. Even tho animal was in fair condition, if there were large cavities lungs from softened tuberculosis the meat should be condem if the animal was in bad condition, whatever the stage of it should also be condemned. There should be some freedo to a competent inspector. Tuberculosis should be added t in the schedule of contagious diseases. All abattoirs shoul spected, and the expense need not be great as a constable non-professional person might be instructed, so as to be lished. He would be prepared to recommend quarantine for 4 months in all cases as he did not think that very much value would be attached to certificates from the breeder or previous owner. If the animal was suffering in any way, quarantine might be prolonged with the right of appeal by the owner for consultation with a duly qualified veterinary surgeon. The question of compensation was a difficult one, but the witness thought that none need be given to the owners of home-bred animals having the disease in unmistakeable form. With reference to inspection at the border, Mr. Kendall said that it ought to be strict, as many tuberculous cattle came from N.S.W. and Queensland. He was not acquainted with the present system, and if all the colonies could agree on some uniform legislation, inspection would not be necessary."

It will be noticed that Mr. Kendall attributes the prevalence of the disease to hereditary transmision as one of the chief causes. In Tasmania where there is so much in breeding, it is quite possible that constitutional diseases may be handed down from one herd to another until in a country of limited area like this island, we find after the lapse of years that the whole of the stock is more or less affected. Hence, the recommendation which all who are conversant with the subject make, is the introduction of fresh stock of hardier breed such as the Polled Angus into Tasmania from time to time, and this is all the more necessary when we come to consider that it is only at intervals during the last 25 years that fresh stock has been imported and then only in very small numbers.

2. Considering the prevalence of scrofulous and tuberculous diseases in dairy cows, it is desirable that all dairies should be regularly inspected, for we know also that no food affords such pabulum for the germs of typhoid and scarlet fever as milk.

3. In remote districts weakly cattle may continue to exist for a long period without interference. The prevalence of disease in such districts could be certified by a constable who could send for a qualified veterinary surgeon to inspect the herd.

4. It is undesirable that weakly or suspected animals should continue to breed or be at large amongst breeding stock. Hence the recommendation of Mr. Kendall's is a good one, viz. that they should be killed off. Further, the inspection of stud bulls has never been attempted in Tasmania, though every one will allow the necessity of it. A license is objectionable for an owner might be willing to pay a license for an unhealthy, though well-bred animal.

5th. Quarantine is of too short a duration to determine the existence of tuberculosis and scrofulous diseases. As it might take a year or more to develop such —and as other diseases, such as foot and mouth, and pleuro pneumonia make their appearance at most under three months, and the former much earlier, no good can be gained by prolonging quarantine over three months. Animals in quarantine who are manifestly labouring under some constitutional disease should be slaughtered at once.

5th. In all large cattle markets beasts are inspected by a competent veterinary surgeon. This is the case at Glasgow, and also at Deptford, where often at both places 2,000 cattle are put up for sale in one day. At these places cattle are inspected beast

the milk from one
children, but little care is taken to see that this cow is a
one ; if the cow be unhealthy, the victimised infant will
daily increasing dose of noxious food unvaryingly poured
system. On other grounds such as the periodical occurrenc
or heat in cows, more frequently in scrofulous cows, the mill
cow only is undesirable, for at such periods the milk is defi
nutritive elements, and would not be so good as milk obt
regular intervals from two or three cows. As a precaution in
with suspected cases, milk ought to be well boiled before usi
may, however, be assured that did those who have the ch
infants know that the milk was likelyto possess such characte
would not use it at all. Some veterinary surgeons assert th
have seen evidence of tubercle in muscular tissue. It is w
muscles or beef that we are mostly concerned as forming the
of our food. If an animal is in good condition, and the n
well roasted or cooked before eating, there can be no da
using it for food, provided there were no extensive marks of
in an advanced stage present in the viscera. The raw me
viscera of osteosarcomatous or tuberculous cattle should n
thrown to dogs or pigs There are he same objections to thi
the general inoculation of rabbits with tubercle, as the ra
ingested must present every facility for the escape of tubercle
into the blood of pigs and dogs, and aid to disseminate tube
and wide. Though Mr. Kendall has not seen tubercle in she
rabbits, it has been observed in these animals by others.

### SLAUGHTER YARDS.

Another recommendation to be made is the removal and im
ment in the working of the slaughteryards or abattoirs. The
of a more fitting site has already occupied the attention of th
Council. The chief requisites are besides being at a su
distance from town that there should be a good fall for dr
and abundant water supply.

Dogs may sometimes be seen wandering about when slaughtering is going on. When we can point out numerous cases of large hydatids of hard cartilaginous flukes and of tubercle spread thro' many of the viscera in the carcases of slaughtered animals ready for human consumption, it is needless to say that no good can result from allowing dogs or other animals to appropriate morsels of the same. Though every expedition is made in the slaughtering of animals after arrival, it is desirable that they should be well fed, and if possible, allowed to graze in the interval. At present they are not well enough fed. In making these remarks I desire to say that the Superintendent uses every means in his power to enforce cleanliness, ventilation, etc., but until new yards are constructed, satisfactory results will not follow.

A suggestion I may make is the establishment of a hulk or floating sheds in the river as an abattoir, where drainage and cleanliness could be perfectly maintained. Animals should be yarded or enclosed on shore prior to slaughtering, and all diseased viscera and condemned meat burnt.

Lastly, all cases of diseased cattle within the city boundary should be reported to the Municipal authorities, or to a Government Stock Office ; and inspection should thereupon take place by a competent veterinary surgeon.

## OBSERVATIONS ON SIX RARE FISHES RECENTLY CAPTURED IN TASMANIAN WATERS.

By Robt. M. Johnston, F.L.S., Etc.

[*Read October* 13, 1884.]

During the last two months several new or rare species of fish have come under my observation, which I have thought desirable to bring specially under the notice of this Society. Mr. Morton has been praiseworthily arousing the interest of local observers in various parts of the island, and it is to him I am chiefly indebted for three of the interesting forms examined and hereafter referred to. The Fishes on the Western, Northern, and North-Eastern parts of the Island are as yet imperfectly known. The recent discovery of the Snipe, or Trumpet Fish (*Centriscus scolopax*), at Port Sorell, by Miss Lodder, and the capture of the Moki (*Latris ciliaris*), so common in New Zealand, at George's Bay, by Mr. W. L. Boyes, lead me to hope that many new forms from these imperfectly investigated regions will soon be added to our list of Tasmanian Fishes. The following are the Fishes particularly referred to :—

### Family Percidæ—Genus *Oligorus.*

Seven branchiostegals ; dorsal with eleven spines ; anal lower than the soft part but two and a-half length; ventrals under the pectorals, which are sh operculum obtusely serrated; scales cycloid. C greyish above lighter below.

A very large representative of this species was captured near the mouth of the Derwent. Unfort had no opportunity for examining the fish personall several occasions I have learned from fishermen of tl of the "Hapuka" in our waters, and from enquirie several intelligent observers I am satisfied that the to *O. gigas* is correct Any doubts existing, how be soon removed. This fish is closely allied to 1 water "Murray cod" (*Oligorus Macquariensis*), and is of more than usual interest seeing the great difl habit of the two fishes. Dr. Hector states (p. 10 of New Zealand) that the "Hapuka" fishing Zealand "is excellent sport, the average weight ( being about 45lb., but occasionally large specimen to 130lb. weight are caught. The head and shoul this fish is most dainty food, but the flesh of re rather coarse and stringy."

### Family Pristipomatidæ—Genus *Erythrich*

Rather elongate; mouth protractile; two do several isolated spines between; caudal forked; n the jaws nor on the palate (*præoperculum entire* rather small, clenoid.

Molucca sea, Sunda sea, Australasian seas, Pacifi

### *Erythrichthys nitidus.* Rich.

B 7; D 13; A 3; P 21; L lat 26; L tr

P.O. is not quite entire, as its margin as well as that of the sub-operculum is very minutely dentate. Color of body uniformly steel-blue above with silvery sides, having, in one aspect, a decidedly pinkish shade. The finer subordinate shades of color on the sides, however, are more or less iridescent, and vary with the position of the observer. The fins are all tinged with pink towards roots and extremities; the pinkish pectoral fin is particularly noticeable. Mr. Charpentier has succeeded very fairly in catching the characteristic colors of this handsome little fish, which, in other respects, is most faithfully described and figured by Dr. Richardson. (Voyage of the Erebus and Terror, p. 47.) My attention was first drawn to this specimen by Mr. Morton, who obtained it in one of the fish-stalls. It was captured with flounders in shallow water near Sorell in the estuary of the Derwent on 18th August This is the first representative of the species seen by me during a residence of 14 years in Tasmania. I have reason to believe, however, that it is seen by fishermen occasionally in the neighborhood of Swansea.

### FAMILY CIRRHITIDÆ.

#### *Latris ciliaris.* Forst.

Locally known as "Moki," in New Zealand. Gunth. II., 86.

B. 6; D. $\frac{17}{39}$; A. $\frac{3}{32}$; P. $\frac{9}{6\text{-}8}$; L. lat. 84.

Length four times that of the head, or three times the height of the body; six to eight simple pectoral rays; no vomerine teeth; above plumbous; below silvery white with small brown dots; fins blackish.

Port Jackson and Tasmania, not common; New Zealand, abundant.

Mr. Morton obtained a fine specimen of the above species from Mr. W. L. Boyes, who captured it in George's Bay. In my catalogue I stated that it was doubtful whether this species really existed in Tasmanian waters, because the Common Bastard Trumpeter (*L. Forsteri*) had been often wrongfully referred to *L. ciliaris.* This matter is now fortunately set at rest.

### FAMILY CENTRISCIDÆ.

#### *Centriscus scolopax, L.*

The *Snipe, Bugler,* or *Trumpet Fish.*

B. 4; D. $\frac{7\text{-}5}{12}$; A. 20; P. 16; V. 5; C. 6 x 4 x 5 x 7.

Gunth. Cat. III., p. 518; Johnston's Cat., p. 123.

The height of the body is contained once and three-fourths to twice and one-third in the distance of the operculum from the base of the caudal.

description. All my doub its existence in Tasmania are now set at rest. It probable, however, that the two closely allied sp *gracilis* and *C. humerosus* also exist in Tasmanian wat

The following are the dimensions of the specimen Miss Lodder :—

| | | |
|---|---|---|
| Total length ... ... ... | 100 | milimetr |
| Length of head ... ... ... | 41½ | ” |
| ” ” snout... ... ... | 27½ | ” |
| Greatest depth ... ... ... | 25 | ” |
| Least ” ... ... ... | 5 | ” |
| Longest spine ... ... ... | 35 | ” |
| Greatest dia. of eye ... ... | 8 | ” |

### FAMILY LABRIDÆ.

### *Cossyphus unimaculatus.* Gunth.

**“ Pig Fish” of Sydney Fishermen (Macleay).**

**Gunth. Cat. IV., p. 109 ; Macleay's Cat., p. No. 6**

**D. $\frac{12}{11}$ ; A. $\frac{3}{12}$ ; L. lat. 36 ; L. tran. $\frac{6}{12}$.**

**Snout pointed, its length being more than one-third head ; head longer than high ; præoperculum minute rated ; pectoral fin obliquely rounded, more than h length of the head ; the ventral longer, the first ray pro The dorsal fin increases gradually in height from th spine to the seventh soft ray ; the last spine is twice a as the first and equal to the ventral spine. The anal are exceedingly strong, the third longest, nearly as l the twelfth dorsal spine : the longest**

This specimen was obtained recently by Mr. Morton from one of the fish-stalls. Its capture in Tasmanian waters is of great interest. No doubt, like the Schnapper, it is a straggler, otherwise it would be captured more frequently on our trumpeter fishing grounds.

### *Labrichthys Mortonii*, n.s.

D. $\frac{9}{11}$; A. $\frac{3}{10}$; L. lat. 23.

Head contained 3⅗ times in total length. A posterior canine tooth; cheek with four rows of minute scales; præoperculum entire. The caudal fin is slightly forked. The muciferous channels of the scales of lateral line are bi- and tri-furcate anterior to peduncle; where the lateral line suddenly descends below posterior of soft dorsal these tubes are all disposed on the upper side and become simply furcate. Color yellowish purple with longitudinal streaks of lighter yellow between each row of scales below lateral line. Dorsal, anal, ventral, and pectoral fins of a lighter shade; the two former fins have the membrane interspaces marbled with yellow spots; there is a longitudinal streak of lighter purple along the base. Extremities of caudal fin of a brighter yellow. *There is a distinct black blotch on the body at root of the last two soft rays of dorsal.*

Total length, 9 inches; length of head, 2½ inches; greatest depth, 2¼ inches.

Mouth of Derwent: Found occasionally at a depth of 40 to 50 fathoms.

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# THE RIVER DERWENT: NOTE UPON THE FLOOD OF 23RD SEPTEMBER, 1884.

BY A. MAULT.

[*Read October* 13, 1884.]

It may be useful to put upon record a few observations upon the late flood in the River Derwent.

I should premise that during the past two years I have had occasion, in connexion with the survey of the Derwent Valley Railway, to take various measurements across the river at several places above New Norfolk; and at these places I have noted the volume of water, and the rate of flow at different seasons. From these observations I inferred that the average flow of water in the Derwent would be equal to that of a river 360 feet wide and 4 feet deep running at the rate of two miles an hour, giving a daily quantity of 13½ million cubic yards, or 10⅓ million tons of water. The

one-half is taken up by evaporation and plant nou
and the other half drained off by the river, the
New Norfolk would have to carry off a mean daily
of 13¼ million cubic yards, or 10¼ million tons of
quantity about equal to that of the foregoing calcu
what is actually carried off.

Residents in the valley above New Norfolk say
flood of the 23rd of last month was higher than
since the great flood of 1863. Below New Norfolk th
said to have risen higher about four years ago, when
the flood coincided with exceptionally high tides in
But both above and below the town mentioned the flo
was much higher. At Valleyfield they say that it w
4 feet higher than that of last month, at Mr. Ing
3 feet, and at the mouth of the Plenty River abou

I did not see the river when the flood was at its h
the 23rd September; but on the 24th, when I exa
the water had gone down several feet, still the ma
greatest height were easily to be seen. At the mou
Dry Creek rivulet this greatest height was about
above the mean level of my former observations, a
mouth of the Plenty River nearly 20 feet. This va
to be accounted for by the difference in the confor
the river at these two points as regards direction, in
and obstructions. I had not the opportunity of
the flood higher up the river.

Although possessed of the sectional area of t
water and many other elements necessary for calcul
quantity of it that was passing, it is quite imp

# *ŒSTRUS OVIS*, OR GADFLY OF THE SHEEP.

By A. Morton, Curator Royal Society's Museum.

[*Read October* 13, 1884.]

A few notes on the introduction of what I am led to believe to be a new grub or fly to Tasmania, may be of some use to the Fellows of the Royal Society. The above insect, I find, is not of any recent date, but is spoken of by a learned physician, Alexander Trallien, in the year 560. They are well-known in Europe, and have been met with at times in the Australian colonies.

About 10 days ago Mr. Maddox, who is connected with a butchering establishment in this city, brought me in a grub that is on the table, saying that in cutting open a sheep's head, near the brain, he found this grub. The sheep it was taken from was one recently introduced from the neighbouring colonies; in none of the Tasmanian sheep, he states, has he found anything like this. Several other gentlemen connected with sheep in this colony have also expressed similar opinions. On examination, and referring to some works on the disease of sheep, I find it to be the *Œstrus ovis*, or Gadfly of the sheep, belonging to the Diptera order, so named from its larvæ inhabiting the nostrils or frontal sinuses of sheep in particular, although it has occasionally been found in goats and deer. In Europe, it assumes its perfect winged form in some uncertain period from May to July; it then becomes an intolerable nuisance to the sheep, especially in woody countries and in the neighbourhood of copses; so much so that if only one fly appears, the whole flock is in the greatest agitation. The larvæ or grub is composed of 10 or 11 rings; when young it is perfectly white, with the exception of two small brown patches by the side of each other at its tail. At some time between the middle of July these larvæ have attained their full growth and seek to escape from their prison. While this is taking place great annoyance is caused to the sheep, continually stamping their feet and sneezing violently. It is stated that the exit of the grub is seldom seen, owing probably to the impatience of the sheep. Very rarely are more than three of these lots found in a sheep's head; some instances have, however, been quoted where a head has contained nearly a dozen. M. Valisnieri, a French naturalist, states that a worm which he took on July the 5th underwent its final change at the expiration of 40 days, but 63 days passed before one which he found in April became a perfect fly. The fly is considerably smaller than the size of the larva would indicate, the length of the wings being nearly equal to that of the body, which they almost entirely cover; they are described as being prettily [illegible] [illegible]. Gasparian (Manuel d'Art p. 468) speaks of frequent convulsions, giddin unconsciousness, distinguished from turn sick sneezing with which it is accompanied. I hav to find out in any of the works on the dis whether the insect causes death.

# TENTATIVE LIST OF THE NAVIGAT VISITED VAN DIEMEN'S LAND SEPTEMBER 1803.

By James Roxburgh McClymont, M

[*Read October* 13, 1884.]

My object in reading this list of early navigat to call attention to the paucity of information reach regarding geographical discovery in Tasman which it is increasingly difficult to remedy, see works which contain such information are be bought up for the libraries of Europe, Ameri other colonies. For this reason the list I no purely tentative. I trust that steps may be tak the deficiency and that, meanwhile, those who p in this department of research in their private col make the fact

*Strait*—finality, at least, so far as explorers from without the colony were concerned. Further corrections, due to the discovery of new harbours on the West Coast, originated with explorers within the colony.

I have restricted this list to those navigators who actually landed or at least anchored off the coast, appending the names of one or two who only sighted it. Following the names are the dates of their visits, from the day on which land was sighted to that on which they lost it inclusive, so far as I have been able to ascertain, and the bibliographical description of the most complete known record of the voyage.

The list is as follows:—

ABEL JANSSEN TASMAN. Nov. 24--Dec. 5, 1642.
Tasman (Abel Janz). *Journal van de Reis naar het onbekende Zuidland in den Jare* 1642. *Medegedeeld door Jacob Swaart.* 8° Amsterdam. 1860.

MARION. March 3—10, 1772. du Fr
Crozet. *Nouveau voyage à la Mer du Sud commencé sous les ordres de M. Marion et achevé sous ceux de M. le Chef: Duchesmeur. Redigé d'après les plans et journaux de M C[rozet. By A. M. de Rochon*]. 8° Paris. 1783.
V n

TOBIAS FURNEAUX. March 9—19, 1773.
Cook (James). *A voyage towards the South Pole and round the world performed in His Majesty's Ships the Resolution and Adventure.* 2 vols. 4° Lond. 1777.

JAMES COOK. Jan. 24—30, 1777.
Cook (James) and King (James). *A voyage to the Pacific Ocean in His Majesty's Ships the Resolution and Discovery.* 3 vols. 4° and atlas fol. Lond. 1784.

WILLIAM BLIGH. Aug. 19—Sept. 4, 1788.
Bligh (William). *A voyage to the South Sea.* 4° Lond. 1792.

THE SAME. February 1792.
“ Plusieurs inscriptions gravées sur des pieds d'arbres nous firent connaître que le Capitaine Bligh avoit mouillé dans cette baie (Adventure Bay) au mois de février 1792.” (Labillardiére. *Relation du voyage à la recherche de la Pérouse.* ii. p. 77.)

JOHN HENRY COX. July 1789.
Mortimer (George). *Observations and remarks during a voyage to the Island of Teneriffe, Amsterdam, Maria's Islands.* 4° Lond. 1791.

*A voyage to*
*in the Investigator, the Porpoise, an*
*land.* 2 vols. 4 and atlas fol. Lond

**Nicolas Baudin.** Several visits between
June 1802.

Péron (François). *Voyage de d*
*terres australes. Historique. Conti*
*Freycinet.* 2 vol. 4° et 2 atlas. I
Freycinet (Louis). *Le même.* .
*Géographie.* 4° et atlas fol. Paris.

**William Raven.** Prior to June (1812) 1802.

"Mr. Raven on his return to En
*Buffalo,* putting into Adventure
some undoubted wool from the hea
that he fell in with there." (Collin
*the English Colony in New South*
188. note.) *

The tender *Supply* of Phillip's 'first fleet'
Diemen's Land about half-past ten on 3
1788. (*The voyage of Governor Phillip to* .
App. p. x.) Flinders embarked in the schoo
when she went to bring off the cargo of the
(wrecked between Preservation and Rum Islan
to make such discoveries as circumstances mig
and sighted the North-east Coast on Fe
(*Terra Australis.* i.pp. cxxxvi-cxxxvii.)

The journal of Tasman was first published *in f*
of Van Keulen, Amsterdam, in 1860, under the edito
Swaart, who discovered a MS. of it in the

possesses Burney's *Chronological History of the Voyages and Discoveries in the South Sea.* 4 pts in 2 vols. 4° Lond. 1803-16, the third part of which contains a brief abridgement of Tasman's Journal, taken from a translation of an old but defective MS. which, at the time of publication, was in the possession of Sir Joseph Banks/ and is now in the British Museum Add. M

The visits of Furneaux and Cook are recorded in *Cook's Voyages*, which are in one or two Tasmanian libraries, but the above-mentioned works of Crozet, Bligh and Mortimer are still awanting.

The only work regarding the important discoveries of Dentrecasteaux and his assistants which is available to inquirers is that of Labillardière; a translation is in the Royal Society's library. This is a personal narrative of the voyage varied with a few botanical and zoological descriptions, but omitting the reports of the various exploring and surveying parties which were despatched from the ships. These are supplied by De Rossel along with the resulting charts in the above-cited volumes which are not obtainable here.

There are several copies of Flinders' *Terra Australis* in Hobart libraries, but they are defective as regards the atlas published to illustrate the text. The volumes of Péron and Freycinet are still desiderata in any library available to the public.

The draughtsman who accompanied Tasman's expedition has left us sketch-maps of *Stoorm Baij, Frederik Hendriks Baij* and *Anthony Van Diemens Landt* and several coast-views. The sketch-maps are reproduced in Burney's abridgement,* but not the coast-views, and as they possess great historical interest as the oldest views of Tasmania, it is most desirable that copies of them should be procured for the colony. They are to be found in Valentyn's (François) *Oud en nieuw Oost-Indien.* 5 tom. fol. Dordrecht. 1724-26,† republished ~~at the same~~ place ~~in 1824-26~~, a work which contains a fund of information regarding early Asiatic and Polynesian discoveries. The next map with which I am acquainted, that contains an outline of the Tasmanian coast, is one executed in 1644 by command of Van Diemen. It delineates as much as was then known to the Dutch of Australia including New Guinea *(Compagnis Niev Nederlandt* and *Noua Guina)*, New Zealand *(Staetelandt)*, Tasmania (*Anthonio Vandiemenslandt*), and the islands of the South Pacific, and shows the course of Tasman in the voyages of 1642 and 1644. There is a copy of this map in the edition of the journal by Swaart. The third map known to me, which introduces Van

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* iii. pp. 67 and 70.
† iii. p. 48.
~~‡ iii. p. 50.~~
* Amsterdam in 1862.

[illegible] *Van Diemens Landt* are evident the two earlier charts, and have been preserve and reproduced by Harris in his *Navigantiu rantium Bibliotheca*, 2 vols. fol. Lond. 1744- Furneaux, Cook, Dentrecasteaux, Flinders, and left charts which are to be found in the mentioned.

There is a chart of the Derwent emanating fro tion of Hayes; but that, along with the memoi dition was captured by a French man-of-war, a to a public institution in Paris. (v. Low's *Hist Navy*, i. p. 200.)

§ i.p.50.

## SUMMARY OF OBSERVATIONS ON EAR PHENOMENA MADE IN TASMANIA 1883 AND 1884.

By Commander Shortt, R.N., Meteorologica
Hobart.

[*Read November* 17, 1884.]

During the last eighteen months Tasmania has by so many earthquake shocks, that general inter excited and favourable opportunities have been tabulated and arranged. Although it would be useless to attempt to reproduce all the reports, yet it seems desirable to bring a short abstract of them before the Royal Society as the chief scientific body in Tasmania, so that members and others may be put in possession of what has really happened, and of the results which may be fairly deduced from the observations. It is hoped that interest in these observations may be thus stimulated, so that any shocks which occur in the future may be more carefully observed and recorded, and we may hope that in time many of the questions which remain for solution may be satisfactorily answered, and others on which one has to speak with great caution may be completely established.

Before discussing reports received it may be well to state briefly the direction in which our enquiries and observations should be made, and what we may fairly hope to learn by careful observation.

In the first place we can hope to learn little as to the causes of earthquakes. With these, although a fertile field of controversy for those who delight in it, we, as observers, have little to do, and therefore they will only be alluded to briefly at the end of the paper.

But there are many problems awaiting solution to which we may devote our attention. Thus we ought to try and find the point directly above the disturbance which causes the earthquake, and from which the " seismic vertical " passes down to that centre. Then to find the directions in which the shock travels out from the centre, and the places at which it arrives simultaneously, so as to determine the coseismic lines, and whether they are circles, ellipses, or quite irregular. To observe the rate at which the wave of disturbance travels ; whether the rate varies in passing through different descriptions of rock, and if so, by how much.

If it is ever reflected or thrown back at the junction of dissimilar rocks,

To determine, if possible, the angle at which the vibration reaches the surface of the ground at different places, and thence to calculate the depth of the disturbance and length of the seismic vertical.

Then the exceedingly important and difficult problem whether any change in the level of the ground has accompanied or followed the earthquake, and if so, whether the change, either elevation or depression, is permanent. Again, whether the shock has been felt equally at all places in the same neighbourhood, and if not, what determines the difference.

These are some of the points on which we may hope to obtain information, but there are others which can be

as a rule to enable us to speak with much
others.

The first thing that strikes one on looki
tabulated reports is the enormous number of
have been felt. Thus, in the month of Fel
nearly one hundred shocks and tremors wer
Mary's, and in some months of 1883 and 188
has been exceeded. Similarly numerous are the
Gould's Country and Moorina, so that since A
when the first shock was recorded at Gould's
one thousand distinct shocks have been felt,
which must have passed unnoticed. Of course
number of these were mere tremors, and such
likely to pass unnoticed by most people. Indee
whether they would be felt at all were not th
attracted by the noise which so often appears t
shock.

Any one who has lived in the vicinity o
especially one on which heavy luggage-trains p
rate of speed, will know what very slight tremor
at a comparatively long distance from the source
Although every shock reported is carefully tab
Meteorological Office, with the date, alleged t
severe, slight, etc., it will only be desirable to
vidually to a few of those which, from their seve
wide area over which they were felt, are of specia
and interest.

The great majority of the slight shocks do
have been felt beyond the N.E. parts of Tasm

can draw through those places on a map a co-seismic line, and if the shocks travel at an equal rate in all directions, the co-seismic lines will be circles, and of course places near the centre of disturbance will feel the shock earlier than those more remote. Further, if we can show that two places are on the same line drawn from about the centre of disturbance we ought to be able to demonstrate the rate at which the vibration travels between the places.

The times reported for the different shocks do not agree very well, so that it is difficult to base any reliable conclusions upon them. Something, however, may be done by comparing the reports of several shocks. Thus, if we take a few dates, and arrange the places in the order of the time at which the shocks are said to have occurred, we find :—

November 14, 1883.—Kent's Group, 2·45 p.m.; St. Mary's, 2·50; Swansea, 2·52; Launceston, 2·55; Gould's Country, 2·55; Falmouth, 3; George's Bay, 3; Moorina, 3·5; Hobart, 3·10.

December 12.—Kent's Group, 6·45 p.m.; Gould's Country, 6·48; Launceston, 6·59; Falmouth, 7; St. Mary's, 7.

March 28, 1884.—Goose Island, 11·28 p.m.; Launceston, 11·36; Kent's Group, 11·40; Hobart, 11·45.

On May 10 and 11 the shocks were severe, and we find—

10.—Falmouth, 10·30 p.m.; Ross, 10·35; Kent's Group, 10·40; Launceston, 10·42; Hobart, 10·43; Goose Island, 10·45; St. Mary's, 10·45.

11.—St. Mary's, 7·30 a.m.; Falmouth, 7·30; Kent's Group, 7·35; Fingal, 7·35; Launceston, 7·36; Ross, 7·37; Hobart, 7·40; Goose Island, 8; Circular Head, 8.

Then, June 17.—Kent's Group, 8·17 p.m.; Cape Barren Island, 8·20; Goose Island, 8·25; Swan Island, 8·26; Launceston, 8·26; St. Mary's, 8·30; Falmouth, 8·30; Hobart, 8·30; Gabo Island, 8·55.

July 13.—Swan Island, 1·20 p.m.; Kent's Group, 1·35; Goose Island, 1·50; St. Mary's, 1·50; Falmouth, 1·55; Moorina, 1·55; George's Bay, 1·55; Upper Ringarooma, 1·55; Launceston, 1·56; Hobart, 1·57; Gould's Country, 2 p.m.; Wilson's Promontory, 1·43; Eden, 2 p.m.; Gabo, 2·20.

August 29.—Swan Island, 10·55 a.m.; St. Mary's, 11; Kent's Group, 11; Moorina, 11·5; Launceston, 11·5; Hobart, 11·6; Gould's Country, 11·10; Falmouth, 11·15; Fingal, 11·15.

The severe shock on September 19 is reported as—Kent's Group, 8·27; Fingal, 8·30; St. Mary's, 8·35; Gould's Country, 8·35; George's Bay, 8·35; Launceston, 8·38; Swan Island, 8·39; Hobart, 8·40; Circular Head, 8·40.

These observations may help to fix the centre of disturbance. Thus the slight shocks, as mentioned, are confined to N.E. Tasmania, while the severer shocks may reach the West Coast of Tasmania, South Victoria, and New South Wales. The places which appear to feel the shocks earliest are Kent's Group, St. Mary's, Swan Island, and places round, later, Launceston, and afterwards, Hobart, Circular Head, etc., and later still, Gabo, and places on the Continent.

Some time since an opinion was published by me that the disturbances originate under the sea to the E. of Barren Island, and this is confirmed by a consideration of subsequent observations, some of which are given above, as well as by reports from ships at sea in that neighbourhood.

It may be admitted, however, that there are serious discrepancies in the times reported for many of the shocks, and this is what we might expect, as such may arise from various causes. For instance, it is almost certain that the correct time is not in all cases reported. Clocks and watches are often out of time, and again, many persons would forget to look at the clock at the time of shock, and afterwards guess it approximately. As one cannot tell how often such mistakes occur, it is only by comparing the reports of a considerable number of shocks that one can speak with any confidence. Another explanation of the discrepancies would be to suppose that the shocks emanate from different centres. This is possible, but must be used with great caution in reasoning, as, unless we suppose the shocks originate about the same place, the value of the observations made as yet would be very small indeed. At the same time, it is very possible that the centre of disturbance is not at a point, but may be along a line. It is also possible that all the shocks do not travel at the same rate. As to this, although a subject of great interest, we cannot say anything at present.

As to the direction from which the shock seems to come, few reliable reports have been received, and even those which have come to hand are little more than rough approximations. In many cases, too, observers appear clearly to have reported the shock as travelling in exactly an opposite direction to the real one, *e.g.*, S. to N. instead of N. to S. However, the reports which seem to be tolerably reliable give a direction such as we might expect if they originate about the place stated.

Of the angle of emergence of the vibration scarcely anything is known, as the shocks are generally much too slight to leave permanent traces, such as cracks in buildings, from which evidence might be obtained on the point, so that we are not yet in a position to calculate the depth at which the disturbance takes place. Similarly we have no direct evidence of alteration in the level of the land. This, however, is always very difficult to determine even on the sea shore, while inland it is very unlikely indeed to be noticed if slight. It may be well to allude here to the idea that the source of disturbance was or is near New Zealand. This seems to be very unlikely, as most of the shocks are only felt over a small area, and in the case of the severer ones in which there are discrepancies in time, besides the sources of error already mentioned, it must be remembered that the "co-seismic lines" are not likely to be true circles, since, in the case of earthquakes in Europe, a shock has been known to travel twice as fast in one direction as it does in the opposite, and it is well known that in South America most of the earthquakes are felt over much longer distances parallel to the chain of the Andes than transverse to that line. Besides this, we have reports from New Zealand that few shocks or tremors have been felt there recently.

It is probably known to most here that Tasmania is united to Australia by a submarine plateau, and that the water is never deeper than 100 fathoms. Beyond the East Coast of Tasmania and Australia the sea bottom rapidly sinks to a depth of over 2,000 fathoms, and continues deep until approaching the coast of New Zealand, so that a deep trough divides us from New Zealand, and earthquake shocks originating there would have to be at a considerable depth to be strongly felt here.

We may therefore claim, I think, to produce our own earthquakes, and not to be dependent for the supply on New Zealand.

As to whether we shall be favoured with a really serious and interesting shock, of course no one can say. But while it would be foolish to deny the possibility of its occurrence here, as it would be in any other part of the world, it would be equally unphilosophical to imagine that, because we have had many slight shocks, we shall therefore have a great one, since it is well known that really severe shocks, which are never common, while they are sometimes preceded by slight ones, in many cases occur without any warning at all. The great earthquake of Lisbon of 1755 is a case in point, and many others might be mentioned. Many places also, such as Comrie, in Perthshire, Scotland, have very many slight shocks, but have never been known to experience a serious one.

The great interest, indeed, of our earthquakes, in a scientific point of view, is the occurrence of such a large number of slight shocks close together in a country where they were previously very rare.

About the causes which produce earthquakes, but little need be said. It is admitted by the best authorities that we know but little of the condition of the interior of the earth, or how the forces with which we are familiar at the surface, act within the earth so as to produce earthquake and volcanic phenomena.

We know that many, perhaps most, rocks even near the surface, are in a state of strain, and that if at any time they yield to this strain a vibration will result which will be propagated through the earth as a tremor or shock. We know also that at a short distance from the surface of the earth in most parts of the world a very high temperature prevails. Also that water is present in most rocks, and that either in the liquid or gaseous state it appears to play a great part in all volcanic eruptions, and to have been present during the formation of most granite and other crystalline rocks. But when we have said this we have to admit that almost all the rest is still in the region of theory or hypothesis.

Of course it is easy to shew that, if the temperature goes on increasing at the rate of about 1° F. for 65ft. of depth, as it does near the surface, we should have at a depth of a few miles an enormous heat. But then we are not sure that it does go on thus increasing, and even if it does we don't know the materials which exist within the earth, or how thew would behave at temperatures, and under pressure of which we have no experience at the surface. It is tolerably clear also that volcanoes are allied to severe earthquakes, but whether all earthquakes are due to similar causes is not so clear.

We know that vast masses of molten rocks must exist within the earth in some places and at some times, since they are poured out at the surface, but we are not, therefore, justified in assuming that the whole interior of the earth is liquid.

Under these circumstances it is far better for those who desire to advance the cause of science to confine themselves to observing rather than to propounding theories.

From what has been said it will be seen the directions in which observations of earthquake phenomena are wanted, and any intelligent person may be placed in a position where careful and judicious observation will lead to valuable results. The time of shocks should be noted with especial care, and if an observer is not sure of the exact time, that should be stated, so that it may be tabulated accordingly. Again, some rough form of seismometer may be devised to determine approximately the direction of the wave. A basin of mercury or treacle, a few pieces of wood, or similar arrangement may furnish a good result if carefully attended to, as an elaborate seismograph or seismometer which may *be out of order* at the very time it is wanted. If clocks are stopped by a shock, it may possibly be found that those only stop whose pendulums vibrate in a particular plane. This should be noted.

In conclusion, it is only right to acknowledge the large amount of trouble which has been taken by many observers in all parts of the island in recording and forwarding reports of the shocks they have felt. Especial mention may be made of:—

Mr. J. R. Hurst, District Surveyor, Moorina,
Mr. A. Campbell, of St. Mary's,
Mr. O. C. Heiden, Gould's Conntry,

owing to the very large number of shocks which they have had to record.

# NOTES ON THE INFUSORIAL PARASITES OF THE TASMANIAN WHITE ANT.

By W. Saville-Kent, F.L.S., F.Z.S., Superintendent and Inspector of Fisheries, Tasmania.

[*Read, November* 17, 1884].

So long since as the year 1856, Mr. C. Lespes, in a memoir devoted to the organisation of the European White Ant (*Termes lucifugus*), recorded the fact that the contents of the intestine of this insect is represented by a brown pulp consisting chiefly of a living agglomeration of Infusoria. No specific description of these Infusoria has been published up to the present date, and it is only so recently as the year 1881, that a detailed account, with illustrations, of the analagous parasites of the American White Ant (*Termes flavipes*), has been contributed by Dr. Joseph Leidy to the "Proceedings of the Academy of Natural Sciences," Philadelphia. Through the kind courtsey of Dr. Leidy, I was enabled to include re-prints of his drawings of these parasitic animalcules in my monograph of the Infusoria then in course of publication, and subsequently received from him while residing in London, a supply of the White Ant with its accompanying parasites for personal examination.

It was with much interest that I discovered soon after my arrival in Tasmania, that a species of White Ant (specific name at present undetermined) abounds in this colony, feeding after the manner of the North-American type upon decaying timber, and having its intestine similarly laden with parasitic Infusoria. On making a close examination of these Infusoria I ascertained furthermore that they agreed with

Leidy's genus *Trichonympha*. It is an elongate
animalcule, having normally a smooth, somewl
posterior region, and an acuminately pointed, hig
anterior portion, which is more or less distinc
in a longitudinal direction. From Dr. Leid
***Trichonympha agilis***, it differs most distinctly in
shortness of the hair-like cilia which clothe the
face of the body. In the last-named species a port
cilia are as long, or longer than the body, and exl
certain conditions, a remarkable plume-like
the Tasmanian species, which, by way
ment to the talented discoverer of the
propose to distinguish by the title of *Tr*
*Leidyi*, the length of the cilia but little ex
of many of the Opalinidæ and other previously
doparasitic Infusoria. It is furthermore not so
cognise in the present species that the cilia, with
their length, form three or four more or less dist
as obtains in the American variety, for while
clothe the equatorial region of the body are som
longer, the entire series merge into one another
imperceptible gradations. In this respect the sp
introduced may be said to resemble an immatur
the American type. The great flexibility of the an
tion of the body is a feature common to the Americ
manian species, both exhibiting in a like manner
to roll this region upon itself in the form of a hel

An important point that was left undetermine
Leidy respecting the structure of ***Trichonympha*** re
precise position of the oral aperture.

distance only from the apical extremity. This orifice takes the form of a transverse slit, and is followed by a narrow œsophageal track which opens into the capacious digestive cavity that occupies one-half or two-thirds of the posterior region of the body. The plan recommended by Dr. Leidy for observing the vital phenomena of these animalcules is to empty out the intestine of the White Ant containing them into a little white of egg. I also have found this material favourable for their observation, but have gained an additional insight into their life history by employing in a like manner thinly diluted milk. In this medium they not only live for a considerable time, but meet with abundant nutriment, their pharynx and digestive cavity being frequently found densely packed with its component corpuscles after their immersion in this fluid for a short interval.

As with the American species *Trichonympha Leidyi* is represented in its earlier and immature conditions by a host of polymorphic forms that differ greatly in aspect from the adults. The youngest observed are of an ovate contour, and clothed throughout with cilia of even length. These young individuals gradually increase in length until their long diameter may equal or even exceed four or five times their greatest breadth, the cilia in the more advanced phases being longest posteriorly, while the surface may be obliquely furrowed in opposite directions. It is in connection with this transitory condition that I have observed the phenomena of propagation not hitherto recorded. This is effected by a process of transverse fission, division taking place towards the anterior region of the body along two intersecting furrows. The anterior of the two separated moieties assumes a pyriform outline, and grows speedily to the parent shape, while the posterior one retains its primitive attenuate fusiform contour, and may continue to multiply by fission.

When placed in diluted milk the animalcules of both the American and Tasmanian species of *Trichonympha* have been observed by me to assume a fixed condition that has not hitherto been described. An attachment to the surface of organic substances or other convenient fulcra, is then accomplished through the medium of the long fascicle of hair-like cilia that are produced from their posterior extremity. These cilia intersecting one another at a short distance from the body form a sort of hollow cone, the expanded base of which grasps the selected fulcrum of support after the manner of an acetabulum. This habit of, as it were, anchoring themselves by their long caudal cilia was observed of both the adult and immature animalcules. No trace of the structure common to all higher Infusoria known as the contractile vesicle has been detected in connection with *Triconympha*.

*agilis*, and in the species now introduced it is, so far as I have been able to ascertain, as conspicuously absent. In this absence of a contractile vesicle *Triconympha* assimilates itself to many Opalinidæ. While commenting upon the apparent position of *Triconympha*, with relation to other Infusorial forms (Manual of Infusoria, Vol. II., p. 553), it was suggested by me that, with respect to the great length of its cilia and characteristic movements, it to some extent resembled the multiflagellate genus *Hexamita*. Though the more abundant evidence since adduced has sufficed to demonstrate that it belongs essentially to the Holotrichous Ciliata, the great length of the cilia, the manner in which they are employed, and the habits the animalcules exbibit of anchoring themselves to foreign substances by their long posterior cilia, is suggestive of the remote derivation of these White Ant parasites from a flagelliferous type allied to *Hexamita*.

Of the two remaining Infusoria found by me in the Tasmanian White Ant the one is apparently referable to Dr. Leidy's genus *Pyrsonympha*, while the other belongs to Stein's multiflagellate genus *Lophomonas*, so far recorded as a parasite only of the Orthopterous insects *Blatta* and *Gryllotalpa*. Several important points in their organisation not having yet been clearly ascertained, descriptive details of these two new forms are reserved for a future communication.

# ON A METHOD OF DETERMINING THE TRUE MERIDIAN.

By H. C. Kingsmill, M.A.

[*Read November* 17, 1884.]

I propose to describe a method of obtaining the true meridian by observation, which, so far as I am aware, has not been tried in this colony. The method is theoretically simple, but many ideas which are simple in theory, are found to have practical difficulties which render them useless in actual work.

I do not think that this objection will apply to the case in question, but I shall be glad to have the opinion of some one who has had experience in taking observations.

Public attention was called to the meridian question some time ago by Mr. McIntyre, a New Zealand surveyor, who gave much valuable information in a paper which he read *before* this Society.

*He pointed out that* magnetic bearings were not sufficiently accurate to form the basis of a permanent survey; that numerous errors had been caused by depending on the compass; and that the true meridian ought to be the datum line, from which all the bearings of a survey should be reckoned.

These views have been generally accepted as correct, and it becomes a matter of interest to know, what means a surveyor has at his disposal for ascertaining the true bearing of his lines.

No doubt the best and easiest way is to connect with some line, the bearing of which has been ascertained with accuracy. But such a line is not always accessible, and a surveyor should have it in his power to establish his bearings by independent observation. This can be done, within a very small limit of error, in fact as near as the theodolite can be read, which is sufficiently accurate.

Observations to ascertain the variation of the compass are being constantly taken at sea, but the same degree of accuracy is not required as in a survey on land. The altitude of the sun or a star is used in most of these methods. In using altitudes we are liable to error from refraction; moreover the theodolite, the land surveyor's instrument, is better suited for measuring horizontal angles or azimuths than altitudes. For these reasons it is desirable to use a method, equally good, in which altitudes are not required. Again, it will be well if we can dispense with a knowledge of the latitude.

It is not a very difficult problem to find the latitude; still there is advantage in having one problem to solve instead of two, and if the surveyor can find the meridian without first finding the latitude, so much the better.

There is another point to be considered in estimating the values of different methods; that is the amount of time consumed in observing. At an observatory this is a secondary consideration. The main point is to obtain perfect accuracy, and for this purpose transits are observed, day after day, and corrections made by the help of the clock. But a surveyor requires something more expeditious.

There are three well-known methods available for him, and I propose to consider them, with reference to the tests already mentioned; and then to apply the same tests to a fourth method, which is the subject of my paper.

The first method is by a single observation of the sun or a star. For this an altitude is required, also a knowledge of the latitude. It is, therefore, open to objection on both accounts.

The second method is by equal altitudes. This requires two observations at an interval of several hours, and is therefore inconvenient in point of time. It often happens, moreover, that when you have taken the first observation, you cannot get a favourable opportunity for the second.

The third method is by observing a single circumpolar star at its greatest elongation. This is a very accurate method and recognised as one of the best, still it requires a knowledge of the latitude.

The fourth method is by observing two circumpolar stars at their greatest elongation, and taking the difference of their azimuths at the time of observation. From the observed difference of azimuths of the two stars, and their declinations as given in the almanac, the azimuth of each star can be obtained. From either azimuth the position of the true meridian can be ascertained at once.

Two stars can be selected which do not differ much in the time of their elongations, consequently there need not be much time spent in observing.

A knowledge of the latitude is not required, and as the only angle observed is horizontal, there is no error from refractions, and the method suits the theodolite.

The formula to be used is given below, and an example is worked out, but I shall not trespass further on your time by reading them.

Let the stars observed be X and Y, X at its greatest eastern elongation, and Y at its greatest western elongation.

Let the azimuth of X be A
,, azimuth of Y ,, B
Declination of X ,, D
Declination of Y ,, E.

Then it may be proved that—

$\text{Tan. } \frac{1}{2} (A-B) = -\text{Tan. } \frac{1}{2} (D+E) \text{ Tan. } \frac{1}{2} (D-E) \text{ Tan. } \frac{1}{2} (A+B)$, which is a formula adapted to logarithmic computation from which A—B can be obtained.

A + B is the difference of readings of the theodolite obtained by directing the telescope first to the star X, and then turning it round to Y, supposing X to come into position first.

When we know A + B and A — B, it is easy to determine the separate values of A and B.

If the stars X and Y are both on the same side of the meridian, the observed angle is A—B, and the same formula may be used by making A + B and A—B change places as follows:—

$\text{Tan. } \frac{1}{2} (A+B) = \text{Tan. } \frac{1}{2} (A-B) \text{ Cot. } \frac{1}{2} (D+E) \text{ Cot. } \frac{1}{2} (D-E)$

To illustrate this formula an example is added, which has been worked out by Mr. A. G. Tofft:—

**The following stars were observed at their greatest elongation on the evening of October 11, 1884:—A Trianguli over its western elongation at**

8h. 4′ 57″ p.m., and Achernar at its eastern elongation at 8h. 49′ 40″ p.m. and the difference of their readings was 76° 10′ 34″. To find their azimuths A and B.

$$\text{Tan. } \tfrac{1}{2}(A-B) = \text{Tan. } \tfrac{1}{2}(A+B) \text{ Tan. } \tfrac{1}{2}(D+E) \text{ Tan. } \tfrac{1}{2}(D-E)$$

$$\begin{aligned}\text{Log. Tan. } \tfrac{1}{2}(A-B) &= \text{Log. Tan. } \tfrac{1}{2}(A+B) + \text{Log. Tan. } \tfrac{1}{2}(D+E) + \text{Log. Tan. } \tfrac{1}{2}(D-E)\\ &= \text{Log. Tan. }(38^\circ\ 5'\ 17'') + \text{Log. Tan. }(63^\circ\ 19'\ 10'') + \text{Log. Tan. }(5^\circ\ 29'\ 35'')\\ &= 9{\cdot}8941851 + 10{\cdot}2987972 + 8{\cdot}9830243\\ &= 9{\cdot}1760066\end{aligned}$$

$$\begin{aligned}\text{Tan. } \tfrac{1}{2}(A-B) &= 8^\circ\ 31'\ 45''\\ \tfrac{1}{2}(A+B) &= 38^\circ\ 5'\ 17'' \text{ as observed}\\ \tfrac{1}{2}(A-B) &= 8^\circ\ 31'\ 45'' \text{ as above.}\end{aligned}$$

Therefore by adding and subtracting these equations we get—

$$A = 46^\circ\ 37'\ 2'' \text{ and } B = 29^\circ\ 33'\ 32''$$

# OBSERVATIONS ON MR. R. M. JOHNSTON'S VITAL STATISTICS.

### By A. B. Biggs.

[*Read November* 17, 1884.]

It would be presumptuous in me to discuss in detail the interesting and ably-compiled Vital Statistics issued by Mr. Johnston for the year 1883. There is one branch of the subject, however, to which my attention was drawn by a sub-leader in the *Mercury* of 10th September, upon which, as it comes somewhat within my own line of study, I think I may, without impertinence, make a few observations. I quote from the article referred to:—" The course of investigation has led to the discovery that there is a coincidence between the minimum and maximum ***sun-spot periods*** and the death-rates, and again, with the ***position of the planet Jupiter*** in his orbit. The ***maximum*** sun-spot period appears to be when Jupiter is between aphelion and perihelion; and this corresponds with the ***lowest*** death-rate, that is, when the depression in the diagram is greatest. On the other hand, the ***minimum*** sun-spot period appears to be when Jupiter is at perihelion, and this corresponds with the ***highest*** point of the diagram of the death-rate, etc." This appears to me to fairly represent the conclusion at which Mr. Johnston has arrived, and which his diagram, so far as it goes, appears to show. Now, the point that immediately struck me on reading this was, that the fluctuations of the death-rate curve might correspond with and be dependent upon *either* the sun-spot periodicity *or* the position of Jupiter in his orbit. But we are not at liberty to couple the two phenomena of Jupiter and sun-spots, inasmuch as the periods, although very nearly equal, are not quite so. The accepted average sun-spot period is 11·11 years, whilst the period of Jupiter is 11·86. There is, therefore, a difference of three-quarters of a year. It follows then, that, starting from an epoch of coincidence, the sun-spot period will gain three-quarters of a year on every revolution of Jupiter, passing all through Jupiter's period in about 166 years. In half that time then, or 83 years, the sun-spot maximum, from being coincident with Jupiter's *perihelion*, will come to coincide with his *aphelion*. It must, therefore, be evident that the sun-spot period has no relation to Jupiter's movements. I am aware that some eminent authorities have favoured the notion that the periods are connected, but it could only have been on the assumption of a different sun-spot period from that which more extended observation has established.

The sun-spot maximum and Jupiter's perihelion are now approaching coincidence, which will probably occur at Jupiter's next perihelion in 1892. Their present near coincidence may very likely have suggested the idea of their being mutually concerned in affecting our death-rate.

There seems to be a disposition in many quarters to attribute some special influence to the planetary positions, especially their perihelia. Jupiter, in particular, being the nearest of the giant planets, as well as by far the largest, would, on both accounts, have immensely more influence than all the others put together; that is, on the supposition that any influence at all could be exercised by any of them on account of orbital position. The idea implies, of course, not a *direct* influence upon the earth itself, but an *indirect* one, exerted through the planet's influence primarily upon the sun. Now, notwithstanding Jupiter's vast bulk, relatively to the other planets, his mass is less than one-thousandth part of that of the sun, and his mean distance 480 millions of miles. At this vast distance it is difficult to conceive of any particular influence that he could exert upon the sun under any circumstances. His relative distances at perihelion and aphelion are as 10 to 11 (very nearly), surely not sufficient difference for the sun to trouble himself about.

Now, why should so much importance be attached to the *perihelion* position, as if it were some critical point, perfectly distinct from every other part of the orbit? The planet is approaching it from the time it leaves its aphelion, and as gradually recedes from it until it reaches aphelion again.

If any influence could be supposed to be exerted by Jupiter upon our affairs, one would think it were more reasonable to look for something direct, as, for instance, when he is in opposition to the sun. He is then, of course, much nearer the earth than when in conjunction, very nearly in the proportion of 10 to 15, or as 1 to 1½. This occurs at intervals of slightly over 13 months. On such a supposition, then, we should have some marked disturbance occurring about a month later every year. But, is it so? I leave this for statisticians to answer.

For my part, I may say that it would require most conclusive argument, backed up by a considerable amount of statistical evidence, to convince me that Jupiter can have any influence upon us whatever, either direct or indirect; that is, of course, apart from the question of gravitational perturbation, an astronomical nicety that does not at present concern us. The question of physical changes in the sun (as the increase or diminution of sun-spots, by whatever cause produced) affecting the conditions of life in our planet, stands, I think, on quite another footing. As the great *heart* of the system, any physical commotion there might well be supposed to affect, more or less, the whole planetary family. That there *is* some connection between such solar disturbances and the electrical condition of our globe seems to be well established. I think it, therefore, not unreasonable to expect that our mortality curve should be affected from this cause.

Unfortunately, our statistics do not extend sufficiently far back to either establish or disprove that any relationship exists between *them* and either sun-spots or Jupiter's position. Moreover, I think that a careful examination of those we have tends rather to discountenance the notion that any such relationship exists.

In the following tables I take the mortality maxima and minima from Mr. Johnston's columns, and the sun-spot periods from Professor Newcombe.

| DATES OF JUPITER'S | | YEARS OF SUN-SPOT. | | YEARS OF DEATH-RATE. | |
|---|---|---|---|---|---|
| PERHN. | APHN. | MAXA. | MINA. | MAX. | MINA. |
| 1797·71 | 1791·78 | 1793 ? | 1810 | 1848 | 1845 |
| 1809·58 | 1803·64 | 1804 | 1823 | 1866 | 1851 |
| 1821·44 | 1815·51 | 1816 | 1833 | 1873 to 1875 | 1860 |
| 1833·30 | 1827·37 | 1829 | 1844 | | 1862 |
| 1845·16 | 1839·23 | 1837 | 1856 | | 1869 |
| 1857·03 | 1851·09 | 1848 | 1867 | | 1879 |
| 1868·89 | 1862·96 | 1860 | (1878) | | |
| 1880·75 | 1874·82 | 1870 | 1889 ? | | |
| 1892·61 | 1886·68 | 1882 | | | |
| | | 1893 ? | | | |

Table showing the approximate coincidences of death-rate *maxima or minima, with Jupiter's perihelion or aphelion positions, and with epochs of sun-spot maxima or minima :

| DEATH-RATE YEARS OF MINIMA. | JUPITER'S PERHN OR APHN. | SUN-SPOT MAXA OR MINA. |
|---|---|---|
| 1845, England only | P. 1845·2 | Min. 1844 |
| 1851,Eng'd with Sweden | A. 1851·1 | —between— |
| 1860, „ „ „ | —between— | M. 1860 |
| 1862, Europe with Tas. | A. 1862·96 | —between— |
| 1869, „ „ Australia | P. 1868·9 | M. 1870 |
| 1879-81 „ „ „ | P. 1880·75 | —between— |
| MAXIMA. | | |
| 1848, England only | —between— | M. 1848 |
| 1866, Europe &Australia | „ | Min. 1867 |
| 1873-5, General. | A. 1874·8 | —between— |

The above tables show, with regard to *Jupiter's positions*, 3 perihelia and 2 aphelia to death-rate min.; also, 1 aphelion to death-rate max. Sun-spots, 2 max. and 1 min., to death-rate min.; also, 1 max. and 1 min. to death-rate max. Nothing very conclusive about this, anyway.

To sum up the foregoing observations, I may say, firstly, that, theoretically, it is highly improbable that Jupiter can have any influence upon us whatever, and that statistics, so far as they go, fail to show that he has.

Secondly, that it is, theoretically, more probable that physical changes in the sun, such as variation in spottedness, should have some such influence, but that solar observations and vital statistics have not run together long enough to establish the fact of any connection between them.

It is interesting to note that Mr. Johnston's death-rate curves all show an upward tendency during the past year or two, corresponding in time with a period of abnormal telluric disturbance, and also with abnormal atmospheric conditions, as shown by our recent *sunset glows*. Considering the intimate relationship that exists between the air we breathe, and our very existence, is it too much to suppose that the circumstance referred to may have something to do with the present upward tendency of our death-rate curves ?

In connection with this enquiry it is much to be regretted that our vital statistics do not reach farther back. However, the question opened up by Mr. Johnston is of sufficient interest to merit special consideration in the future, although the phenomena in question, unlike the sanitary arrangements which are supposed to engage the attention of our municipal authorities, are absolutely beyond our control.

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*Abbreviations—" M.," maximum ; " Min.," minimum ; " P." perihelion; "A.," aphelion.

# A REJOINDER TO MR. A. B. BIGGS'S CRITICISM ON OBSERVATIONS MADE IN RESPECT OF THE "OBSERVED PERIODICITY OF THE DEATH RATE." ETC.

By R. M. Johnston, F.L.S., Etc.

[*Read November* 17, 1884.]

I am glad to see that so able a critic as Mr. Biggs has taken up the important subject of the "Death rate in its observed coincident relation to super-terrestrial phenomena," which was recently introduced by me in a paper read before this Society; although, at the same time, it is to be regretted that he has based his remarks upon a brief abstract from a newspaper rather than upon the paper itself, for it has greatly misled him as regards the nature and scope of my argument.

It appears to me to be very clear that Mr. Biggs' difficulty is caused chiefly by erroneously assuming that the relations commented upon are *simple* instead of *complex*, and that belief in a more or less striking observed *coincidence* seems to be regarded by him as synonymous with a like belief in a corresponding *mutual inter-dependence* between the matters which have been observed to coincide.

Now there is a very wide difference between the conception or conviction of a known agreement or *coincidence* and the conception of an underlying casual relation. We can fairly conceive and admit of identity of movement or action between several phenomena for a limited space of time without prejudice, even when we assume that such coincidence is not uninterrupted for a longer period, or that it may be due (1) to mutual inter-dependence alone; (2) to causes unknown acting independently; (3) to causes unknown acting together; (4) to certain causes known and unknown, or imperfectly known, acting in combination.

Mr. Biggs, therefore, has somehow failed to grasp the scope of my argument when he sets himself to the task to prove that the movements of Jupiter have no appreciable "influence whatever, direct or indirect," upon the coincident phenomena, simply because the variable cycles of the maxima and minima of sun-spots, death rate, magnetic inclination, rainfall, etc., are not *solely* influenced by the movements of Jupiter primarily. This is proving a negative in reference to a complex problem, by ignoring all the factors necessary to arrive at a correct conclusion, save one—viz., the supposed value of Jupiter's influence. Even this influence seems to be unnecessarily restricted by him to the mere point when Jupiter is exactly in *perihelion.*

Mr. Biggs, by demanding proof and demonstration sufficient to produce conviction, again fails to grasp the object of my paper, which so far as the casual aspect of the phenomena discussed is concerned, is most guardedly restricted by me to *mere suggestion.* Now, had he studied my paper closely instead of the brief abstract referred to, he would find that I pointed out that the "coincidences observed are not sufficiently broad and regular to justify prediction;" that, at present, inferences drawn from them are "more suggestive than conclusive," and in consideration of many unexplained anomalies due to unknown and complex relations, I could only hazard from them "*presumption*" in favour of a relatively low death rate in Australasia during years of sun-spot maxima, and a more or less relatively high death rate during years of sun-spot minima. In this last respect it is a pleasure to me to find that I am in accord with Mr. Biggs, who also, with Young, Scott, and others, admits that there seems to be a well-established connection between "solar disturbances and the electrical condition of our globe."

Professor Balfour Stewart, the celebrated physicist and author of the profound work "On the Conservation of Energy" (Inter Series, 1874), in a paper read by him on "Magnetic Declination" (See *Nature,* April, p. 592), states that, although Professor Rudolph Wolf's list of sun-spot observations "extends back into the seventeenth century, and is unquestionably of much value, nevertheless, it must be borne in mind that we possess no sun-spot data sufficiently accurate for a discussion of questions relating to solar periodicity before the time when Schwabe had finally matured his system of solar observations, which was not until the year 1832." Curiously enough that is just one year prior to the period from which my diagram records the coincidences between the solar and planetary phenomena. This being so, it follows, as stated by R. H. Scott (p. 392, Elementary Meteorology, Inter. Series, 1883), that apart from the last four or five sun-spot cycles which have actually varied from seven years to 14 years, "the data at present available are insufficient to establish satisfactorily" "the precise duration" of extended sun-spot periodicity, and hence Mr. Biggs's argument against the supposed influence of Jupiter, based upon the small differences of the mean of sun-spot periodicity as compared with the period of Jupiter, is not of much force, although in other respects his argument is well sustained and of considerable value.

Although, with Mr. R. H. Scott, I am fully convinced that as yet "it can scarcely be said that the close relation between solar and terrestrial phenomena is capable of accurate demonstration," still, with Tyndall, I am impressed with the feeling that " these guesses and conjectures are by no means leaps in the dark, for knowledge once gained casts a faint light beyond its own immediate boundaries. There is no discovery so limited as not to illuminate something beyond itself." (Scientific Materialism, p. 77.)

## DEAL ISLAND.

The following census of the flora of Deal Island, in Kent's Group, was laid on the table by Mr. Justice Dobson, who had enlisted the services of the Superintendent of the Lighthouse on the Island, Mr. Johnstone, to collect and send him specimens of all plants growing there. These were forwarded to Sir F. Von Mueller, who prepared the census. One plant, an orchid, " Pterostylis vittata," is new to Tasmania, but is common to the Continent of Australia:—

Clematis microphylla, De Candolle.
Bursaria spinosa, Cavandolle.
Comesperma volubile, Libillardiere.
Geranium pilosum, Forster.
Zieria Smithii, Andrews.
Correa speciosa, Andrews.
Beyera opava, F. V. Mueller.
Phyllanthus Gunnii, J. Hooker.
Casuarina distyla, Vent.
Tetragonia implexicoma, J. Hooker.
Mesembrianthemum aequilaterale, Haworth.
Stackhousia linarifolia, Cunningham.
Pomaderris apetala, Labillardiere.
Pultenæa daphnoides, Smith.
Goodia latifolia, Salisbury.

Swainsona lessertifolia, De Candolle.
Acacia longifolia, Willdenow.
var mucronata et var Sophorne.
Acacia verticillata, Willdenou.
Acæna sanginsorbæ, Vahl.
Calycothrix tetragona, Labillardiere.
Leptospermum scoparium, Forster.
lævigatum, F. V. Mueller.
Eucalyptus obliqua, L'Hert.
Melaleuca ericifolia, Smith.
Kunzea corifolia, Reichenbach:
Pimelia linifolia, Smith.
Banksia marginata, Canamilles.
Aster argophyllus, Labillardiere.
,, stellulatus ,,
Helichrysum ferrugineum, Less.
,, cinereum, F. V. Mueller.
,, apiculatum, De Candolle.
Senecio lautus, Forster.
Styphelia Richei, Labillardiere.
,, oxycedrus, ,,
Epacris impressa, ,,
Candollea oerruloto, ,,
Goodenia ovata, Smith.
Alyxia buxifolia, R. Brown.
Myoporum insulare, ,,
Callitris cupressiformis, Butomat.
Caladenia latifolia, R. Brown.
Pterostylis vittata, Lindley.
Cyrtostylis reniformis, R. Brown.
Corysanthes pruinosa, Cunningham.
Dianella revoluta, R. Brown.
Typha agustifolia, Limme.
Juncus pallidus, R. Brown.
Luzula campestris, Candolle.
Lepidosperma gladiatum, Labillardiere.
Cladium trifidum, F. V. Mueller.
Festuca litoralis, Labillardiere.
Spinifex hirsutus, ,,
Polypodium pustulatum, Forster.
Asplenium marinum, Linne.
Pteris falcata, R. Brown.
,, aquilina, Linne.
Brachycome diversifolia, Fischer and Meyer.
var Maritima, Beath.

# PAPERS AND PROCEEDINGS

OF THE

# ROYAL SOCIETY

OF

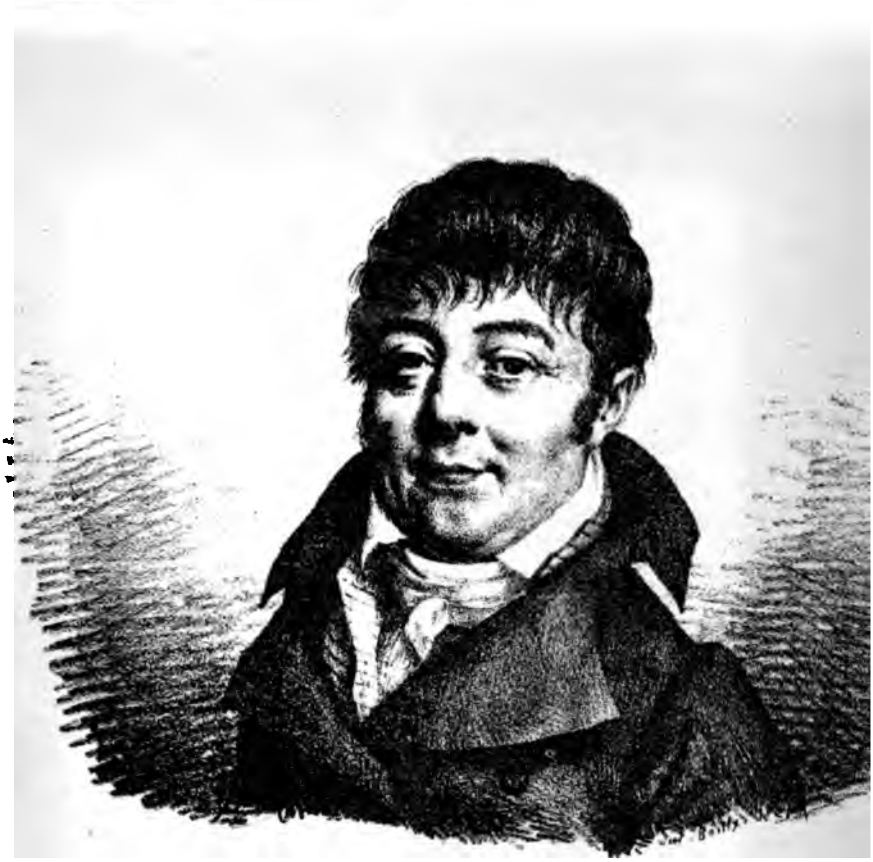
# TASMANIA,

FOR

# 1885.

TASMANIA:
PRINTED AT "THE MERCURY" OFFICE HOBART.

1886.



Institut Royal
de
France

Acadie des sciences (Botanique)

**DE LA BILLARDIÈRE,**
(Jacques Julien)

*Né à Alençon, (Orne) le 28 Octobre 1755, élu en 1800.*

*Photo-lithographed at the Crown Lands Department Hobart*

THE responsibility of the statements and opinions given in the following papers and discussions, rests with the individual authors; the Society as a body merely places them on record.

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## *ERRATA,*

### JUNGERMANNIA RETICULATA.

Herr Stephani, a noted specialist in Germany, has, at the request of Baron von Müeller, examined this plant, and he refers it to Polyotus Magellanicus, Jung. Magellanicus of Hook. Mux. Exot. Mr. Boswell, of Oxford, and Mr. Pearson, of Manchester, also refers it to that species. It differs from J. reticulata, Hook. in that the stipules on the main stem are entire, except a slight notch at the apex of a roundish form. Richd. A. Bastow.

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Vol. 1884.—Page 260, line 16, &c., for "*Swaart,*" read *Swart*; line 20, for "*Duchesmeur,*" read *Duclesmeur.*

Page 262, line 33, Delete "republished at the same place in 1824-26."

Page 262, Delete foot-note "§ i. p. 50."

Page 263, insert § i. p. 50.

# ROYAL SOCIETY.

## APRIL, 1885.

A monthly meeting of the Society—the first of the session of 1885—was held at the Royal Society's rooms, on Tuesday, April 14. There was a large attendance of Fellows. Mr. James Barnard, vice-president, occupied the chair.

The following gentlemen were elected Fellows:—The Premier (Hon. Adye Douglas, M.L.C.), Mr. Justice Giblin; Messrs. E. Edmondson, Joseph Davies (Beaconsfield), H. J. Burnett, J. C. Hadley, G. H. Edwards, J. F. MacMullen, Arthur Butler, H. T. Maning, and the Rev. T. M. O'Callaghan.

The HON. SECRETARY (Dr. Agnew), said that amongst the novelties laid on the table that eveinng was a catalogue of the library, prepared by the Curator, and which had long been a great desideratum, and it had been compiled now with such completeness that it would be a very valuable possession for some time to come. It was so arranged that any books received in the future could have their names inserted in the proper place. Mr. Morton deserved the greatest credit for the assiduity and ability which he had shown in the compilation of this very useful book, and thanks were not only due to him, but also to the Government for kindly allowing it to be printed at the Government printing office, and so saving the society a great deal of expense. The officers of the department, Messrs. Strutt and Grahame, had shown such an amount of attention, care, skill, and interest in the mechanical part of the work that he could hardly find words to thank them. An enormous amount of trouble had been occasioned by the printing of the work, but it was now in all probability placed in the hands of the Fellows in as perfect a form as possible. He moved,—"That the cordial thanks of the society be given to Mr. Morton for his compilation of the work, and also to Messrs. Strutt and Grahame for the part they had taken in its issue." (Applause.)

Mr. C. P. SPRENT seconded the motion, which was carried unanimously with acclamation.

The HON. SECRETARY (Dr. Agnew) brought forward the usual returns, viz.:—

1. Number of visitors to the Museum:—January—On Sundays 640, on week days 1,892, total 2,532; do. February—On Sundays 742, on week days 1,324, total, 2,066; do. March—On Sundays 567, on week days 1,336, total, 1,896.

2. Number of visitors to Royal Society's Gardens:—January, 6,500; February, 6,000; March, 5,570

Plants and Seeds received at and sent from the Royal Society's Gardens during the month of January, 1885:—

From Baron Ferd. von Müeller, 48 packets seeds.

From Messrs. Heyne Co., Adelaide, 4 packets seeds.

From Mr. C. F. Creswell, collection of imported bulbs, about 300 varieties.

From Miss Brumby, Old Beach, eight packets seeds.

From Messrs. Heyne Co., Adelaide, three packets boronia seeds.

From Baron Ferd Von Müeller, 14 packets seeds.

From Miss Woodin, seeds Japan Coniferæ and lily bulbs.

To Messrs. Law, Somner, Melbourne, two bags sphagnum moss.

To Mr. Wm. Bull, London, case containing ferns.

To Dr. R. Schomburgh, Adelaide, sphagnum moss.

From Messrs. A. Van Geert, Belgium, five bags abico seeds.

From Mr. Wm. Bull, London, 32 packets seeds and bulbs.

From Miss Woodin, 25 packets seeds from Japan, principally choice Coniferæs.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's gardens during March 1885:—

8th. Seckle pear commencing to ripen.
10th. Tips of hornbeam commencing to turn brown.
12th. Coe's golden drop plum ripe.
14th. Tips of elm turning yellow.
17th. Horse chestnut leaves turning brown.
18th. Ash leaves commencing to fall.
25th. Oak leaves commencing to fall. Acorns ripe.
10th. Veronica augustifolia in flower.
14th. Royal apricot commence to ripen.
16th. Grevillea robusta in full flower.
19th. Jargonelle pear ripe.
24th. Black mulberries commence ripen.
1st. Windsor pear commence to ripen.
3rd. Bon chretien commence to ripen.
14th. Blackberries commence to ripen.
25th. Ash commencing to shed seed.
28th. Sycamore commencing to shed seed.

### METEOROLOGICAL RETURNS.

From the Government observer, Capt. Shortt, R.N., table of observations for January, February, and March. From Mr. F. Abbott, superintendent of the Royal Society's Gardens, register of rainfall for January, February, and March.

Additions to the Library during the months January, February, March:—

Acta Horti Petropolitani Tomus VIII., IX, Fasciculus I.-II., from the society.

Administration's report of the Meteorological Reporter to the Government of Madras for the years 1883-1884, from the Meteorological Department, India.

*Agricultural Gazette*, December, 1884; January, February, 1885.

*American Agriculturist.*

Annals de la Societe, Malacologique de Belgique, Tome XIV., XV., XVI., from the society.

Annals and Magazines of Natural History, January and February, 1885.

Annual Report of the Surgeon-General U.S. Army, 1884.

Annual Report of the Curator of the Museum of Comparative Zoology at Harvard College, 1883-4, from L. Agassiz.

Annual Report of the Chief Signal Officer to the Secretary of War. Part 1 and 2. Washington, from the War department.

Archives du Musee Teyler, serie II., Troisiéme partie, Deuxieme partie, from the society.

Astronomical and meteorological observations, year 1878-79, Washington, from the U.S. Naval Observatory.

*Athenæum*, The, December, 1884.

Bericht des Verines für Naturkunde, XXIX., XXX., from the society.

Boletin de la Academie National, Tome VI., from the society.

Bulletin of International Meteorology, January to August, 1883, Washington, from the War department.

Bulletin of the Essex Institute, January, February, March, 1882, from the society.

Bulletin of the Buffalo Society of Nat. Sciences, vol. IV., No. 2, Buffalo, from the society.

Catalogue of zoological works, comprising icthyology, etc. Catalogue of ornithology, mammalia, etc. Catalogue of entomology, from J. Wheldon and Co.

Catalogue of papers and works relating to the mammalian orders, marsupialia, and monotremata, from J. J. Fletcher, Esq., M.A.B. Sc.

Catalogue of superior second-hand books, J. Sotheran & Co.

Catalogue of the Australian Hydroid zoophytes, by W. Bale, Esq., from the trustees Sydney museum.

Catalogue of the choicest portion of the Lyston Park Library, from B. Quaritch, Esq.

Chronologie geologique, la., from E. Dupont, Esq.

Charts of relative storm frequency for a portion of the Northern Hemisphere. Charts and tables showing geographical distribution of rainfall in the U.S., from the War Department, Washington.

Colonies and India, The, January 16, 1885. Comparative vocabularies of the Indian tribes of British Columbia, with map, from A. R. C. Selwyn, Esq.

Compte-rendu de excursion, etc., D. Ræymaekers.

Daily bulletin of meteorological observations, from the Meteorological Observatory, Washington.

Descriptive sketch of the physical geographical geology of the Dominion of Canada, from A. R. C. Selwyn, Esq.

Essex Institute, historical collection, vol. XIX., from the society.

Gardener's Chronicle, December, 1884, January, February, 1885. Geology of Wisconsin, Vol. IV., I., 1873-79. From H. H. Bennett, Esq.

Geological Magazine, January, February, 1885. Goldfields of Victoria, the reports of the Mining Registrars, 1884. From the Department of Mines.

Government Statist's Report on the Vital Statistics of Melbourne and Suburbs, 1884. From the Government Statist.

Hourly Readings, 1881, No. 51, Part 3. From the Meteorological Office, London.

International simultaneous meteorological observations and charts, from the War Department, Washington.

Indian meteorological memoirs, vol. II., III., 1884, from the Meteorological Office, Calcutta.

Instructions for making meteorological observations, prepared for use in China, from the Government Astronomer.

Journal of the Statistical Society of London, part 1 to 4., vol. XLVI.; part 1, vol. XLVII.; part 1, vol. XLVIII., 1883-4.

Journal of the Linnean Society of London, Nos. 126 to 133, vol. XX, 1883 4; Nos. 97 to 102, vol. XXIII., 1883-4.

Journal of the Royal Historical and Archæological Association of Ireland, Vol. VI., 4th series 1883. Nos. 53 to 56.

Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. XVI., parts 1, 2, 3, 1884, new series

Journal of the Society of Arts, Vol. XXXI., Nov. 1882 to Nov., 1883.

Journal of the Microscopical Society, Vol. IV., part 6, December, 1884, February, 1885.

Journal and Proceedings of the Hamilton Association 1882-3, Vol. 1, part 1.

Journal of Science, January, February, March.

List of the Fellows of the Linnean Society of London, October, 1883.

List of the Fellows of the Zoological Society of London, 1883.

List of the Fellows of the Geological Society of London.

List of the vertebrated animals in the Zoological Society of London, 8th edition, 1883.

Marine Annelids of the order Serpulia: some observations on their anatomy, with the characteristics of the Australian species. By W. A. Haswell, Esq., B. Sc. From the author.

Memoirs of the Royal Astronomical Society of London. Vol. 47, 1882-83.

Memoirs of the Boston Society of Natural History. Vol. III., No. VI., 1883. Vol. III., No. VII., 1883.

Memoirs of the Geological Survey of India. Palæontologia Indica series X., vol. II., pt. 5.

Meteorological and physical observations in the East Coast of British America.

Meteorological observations made at the Adelaide Observ. and other places in South Australia, 1882.

Medical and Surgical History of the War of the Rebellion. Pt. III. Surgical vol.

Meteorological observations, Wellington, New Zealand, December, January, February, from the Government astronomer.

Melanges Geologique et Malacologiques, from D. Ræymaeker, Esq.

Midland Medical Miscellany, The; vol. 4, No. 38, from the society.

Monthly notices of the Royal Astronomical Society, vol. XLV., No. 1, November, 1884, No. 2, December, 1884, from the society.

Monthly weather review (general) weather service of the United States, January to October, 1883, from the War Department, Washington.

Monthly weather report of the Meteor. office, London, for September, 1884, from the Meteor. office.

Monthly weather report, June, July, August, October, 1884, London, from the Meteor. Department.

Monthly record meteorology, Victoria, November and December, 1884, from R. L. Ellery, Esq.

Motions of fluids and solids on the earth's surface, No. VIII., from the War Department, Washington.

Nature, vol. 31, December, 1884; vol. 31, January, 1885.

Pamphlets (15), from the Societie Americaine de France.

Popular Essays on the Movements of the Atmosphere, No. XII., Washington, from the War Department.

Proceedings of the Zoological Society of London, part I. to IV., 1883; part I., 1885.

Proceedings of the Royal Geographical Society of London, vol. V., VI., 1883-4.

Proceedings of the Linnean Society of London, November, 1882, to June, 1883.

Proceedings of the Royal Colonial Institution of Great Britain, vol. X., part I.-II.

Proceedings of the Davenport Academy of Natural Sciences, vol. III., No. 1, vol. 3, parts 2-3.

Proceedings of the Canadian Institute (Toronto), vol. I, No. 34.

Proceedings of the American Association for the Advancement of Science, Salem, from the society.

Proceedings of the American Academy of Arts and Sciences, new series, vol. IX., June, 1881, to June, 1882; vol. X., whole series, XVIII., May, 1882, to May, 1883.

Proceedings of the Academy of Natural Sciences of Philadelphia, pts. 1, 2, 3. January to December, 1883.

Proceedings of the Boston Society of Natural History, vol. XXI., pt. 4, January to April, 1882; vol. XXII., May to November, 1882.

Proceedings of the American Philosophical Society, vol. XX., June to December, 1882; vol. X., January to April, 1883, May to October, 1884.

Proceedings of the Linnean Society of New South Wales, vol. IX., pt. 4.

Proceedings of the Yorkshire Geological and Polytechnic Society, new series, vol. VIII., pt. 3. From the societies.

Preis-Verzeichniss, Chemischer, etc., from Dr. Krantz.

Quarterly journal of the Geological Society, London, vol. 39, parts 2, 3, 4, 1883, vol. 40, parts 1 and 2, 1884, from the society.

Quarterly weather report for 1878. Appendices and plates, London, from the Meteor. Office.

Quelques observations from D. Raeymaekers, Esq.

Records of the geological survey of India, vol. 18, part 1, 1885, from the Geological Survey Office.

Report of the British Association for the advancement of science, from the society.

Report on the results of dredging, "Report in the Blake Echini," vol. XXIV., part 1, by A. Agassiz, Esq., from A. Agassiz, Esq.

Report of the Technological, Industrial, and Sanitary Museum, Sydney, for 1884, from the society.

Royal Colonial Institute, report and proc. Vol. 14, 1882-83, from the society.

Rules of the Linnean Society of New South Wales, and list of the members. February, 1885, from the society.

Rheinisches Mineralien-comptoir (4 pamphlets), from Dr. Krantz.

Signal Service Tables of Rainfall and Temperature compared with the crop production, No. 10, from War Department, Washington.

Smithsonian Report for 1881, from the society.

Studies on the Elasmobranch Skeleton. By W. A. Haswell, Esq., B. Sc., from the author.

Statistical Register of the colony of Victoria for 1883, and index, from the Government Statist.

Tickle's Colonial Export, Prices Current, and Trade Review.

Transactions of the Institution of Engineers and Shipbuilders in Scotland, vol. 26, 1882-83, from the society.

Transactions and proceedings of the Royal Society of South Australia, vol. VIII. for 1883-4, from the trustees.

Verein für Naturkunde gu Kassel, from the society.

Verhandlungen des Naturhistorischen Vereines der preussischen Rheinlande und Westfalens, by Dr. C. J. Andra. Zweite Hälfte, 1882. Erste Hälfte, 1883. Zweite Hälfte, 1883, from the society.

Victorian Year Book for 1883-4, by Mr. H. H. Hayter, from the author.

Victorian Naturalist, January, February, March, 1885, from the society.

Vital and Meteorological Statistics of Hobart and Launceston, from the Government Statist.

Washington Astronomical and Meteorological Observations, Vols. XXV., XXVI., 1878-9, from the Meteorological Dept.

Wood Pavement Board Report—Minutes of Proceedings and Appendix, Sydney, New South Wales, 1884, from Professor A. Liversidge.

## PRESENTATIONS TO THE MUSEUM.

### Mammals.

Golden-bellied beaver rat, Hydromys chrysogaster, Master A. Swan.

Golden-bellied beaver rat, Hydromys chrysogaster, Mr. Propsting.

Kangaroo rat, Hypsiprymnus apicalis, Mr. R. Alomes.

Hairy echidna, Echidna setosa, Mr. Flexmore.

Skull of native tiger, Thylacinus cynocephalus, Mr. Wilson.

### Birds.

Nankeen crane, Nycticorax caledonicus, Mrs. John Lord.
Skua Gull, Lestris cattaractes, Colonel W. V. Legge, R.A.
White-fronted falcon, Falco lunulatus, Mr. C. C. Nairn.
New Holland Goshawk, Astur novæ-hollandiæ, Mr. H. Stannard.
Australian Goshawk, Astur approximans, Mr. E. C. Wright.
Australian Goshawk, Astur approximans, Mr. C. Meredith.
Collection of New Zealand bird skins, Mr. A. F. B. Hull.
Red-capped Dottrel, Hiaticula ruficapilla, Mr. C. Blyth.
Little Penguin, Spheniscus minor, Mr. Propsting.

### Reptiles.

Diamond snake of Tasmania, or copper head of Victoria, Hoplocephalus superbus, Mr. E. D. Swan.
The Tiger snake, Hoplocephalus curtus, Mr. Geo. Hinsby.
Diamond snake, Hoplocephalus superbus, Mr. J. R. McClymont.

### Fishes.

The Thresher or Fox Shark, Alopecias Vulpes, Mr. John Swan.
Three Elephant Fish, Callorhynchus antarticus.
Stone-lifter or Catfish, Kathetostoma læve.
Porcupine Fish, Chilomycterus jaculiferus.
Sea Horse, Hippocampus abdominalis, Mr. F. Self.
A collection of the Freshwater Herring or Cucumber Fish, Prototroctes maræna, Mr. John Swan.

### Shells.

Haliotis nævosa, Mr. H. Haywood.
An Octopus, Mr. F. Self.

### Insects.

A moth, Mr. J. Northcote.
Two moths, Cossus sp., Mr. E. Palmer.
A moth, Cossus sp., Mr. C. H. Lovett.
Orthopterus insect, Mr. Maning.
A moth, Rev. Mr. Wilson.
A collection of insects, Mr. J. McCance.

### Old Newspapers, etc.

A collection of English papers, Mr. Justin McC. Browne.
The *Samoan Reporter*, 1847, Rev. H. Freeland.
Promissory note, value 3d., Hobart Town, 1825.
Programme of the 12th anniversary regatta, Hobart, November 30, 1849, Mr. W. H. Buckland.
One guinea (paper) on the Falkirk Union Bank, October, 1812, Mrs. Geo. Hinsby.

### PAPERS.

The Hon. Secretary, Dr. AGNEW, stated he had received a letter from Baron Von Mueller, accompanied with a most elaborate paper entitled "The Zoology of Australia," written by that distinguished scientist of Sydney, New South Wales, the Hon. W. Macleay, F.L.S. The paper, the Baron stated, was written at his request for a great forthcoming work in Germany, but as it contained some very valuable information, the Baron thought it was highly important that it should appear in its original English before leaving for Germany. As the paper embraced 51 pages of foolscap, only a part of it was read.

Col. LEGGE, in answer to an appeal from the hon. sec., said the review was a very interesting one. The most salient point about the region was that the great family order of the Woodpecker was totally absent from it, and it was the only region in the world similarly situated. He also referred to the great number of Petrels in the region. The subject, in his opinion, had been very exhaustively treated in the paper which had been read.

Mr. E. D. SWAN said the absence of the Woodpecker was, according to Gould, owing to the Australian trees shedding their bark, so that the beaks of the birds would not be required to bore into the trees to get insects for food.

Col. LEGGE said it would be very interesting to acclimatise them here and see the result.

A paper by Mr. A. B. Biggs, Launceston, entitled "The Lunar Eclipse of 30-31st March, 1885." The paper was not long, but of great interest to those who pay particular interest in astronomical studies.

A paper, by R. M. Johnston, F.L.S., on the character and relationship of the upper palæozoic and mesozoic formations of Tasmania, and the associated diabasic rocks, illustrated by specimens collected by him in various parts of the colony, and an account of a collection of ferns made by Mr. J. R. McClymont at the Cascades.

Prior to reading his paper on the character and relationship of the Upper Pal. and Mesozoic formations of Tasmania, with the diabasic rocks, Mr. Johnston announced that he had discovered at Porter Hill, near Hobart, an important series of beds, showing a gradual transition upwards, without stratigraphical break of any kind, from the common limestone restricted to marine organisms, to fine sandy shales where the marine organisms have altogether disappeared, with the exception of a minute ostracod. These upper beds are replete with plant remains, chiefly of ferns, allied to the genera — Gangamopteris, Cyclopteris, and possibly Pecopteris. The fossiliferous marine limestones and mudstones, replete with the common forms belonging to the genera Stenopora, Protoretepora, Fenestella, Spirifera, Strophalosia, Terebratula, etc., are followed by thin passaged beds of alternating dark brown sandstones and friable shales, where most of the common lower forms disappear, with the exception of Spirifer Tasmaniensis and P. Darwinii. In these shales a species of Cythere swarms in the greatest number, together with species belonging to the genera Modiolopsis, Tellinomya, and Theca. In these latter beds also the plant remains referred to begin to make their appearance, and in the uppermost shales the plant remains, and an occasional Cythere, with the articulated spines, probably of a species of Ichthyodorulites alone are to be found. Mr. Johnston is of opinion that these upper beds with plant remains are the equivalents of the Tasmanite stage of the upper marine beds of the Mersey.

Mr. JOHNSTON also announced that Mr. McClymont had kindly forwarded to him for the society's collection the following interesting ferns from the Cascades, Tasman's Peninsula, viz.:—Lomaria patersoni, L. lanceolata, L. procera, L. discolor, Polypodium billardieri, Aspidium capense, Grammitis australis, Hymenophyllum rarum, H. crispatum.

Mr. R. A. BASTOW read a paper entitled "Jungermannia reticulata." This interesting paper was accompanied with some beautifully-mounted specimens shown by the microscope.

The Superintendent and Inspector of Fisheries, Mr. SAVILLE-KENT, F.L.S.,F.Z.P., exhibited and made remarks upon the ova and living fry of the Cucumber Mullet, Herring, or Grayling (Prototroctes maræna). The eggs taken and artificially impregnated from fish caught in the Mersey, at Labrobe, were rapidly hatching out in his aquarium. A period of precisely three weeks had elapsed from the collection of the eggs and the appearance of the first fish, the "eyed" condition of the ova having been entered upon on the expiration of the first fortnight. The artificial impregnation or collection of the eggs of this fish not having been previously accomplished it was a point of interest to ascertain whether they were deposited by the parent among the gravel in the river bed, as is the case with the Salmon Trout, and European Grayling (Thymallus), or whether, as obtains with another allied form, the

European Cucumber Smelt (Osmerus), they are deposited upon and adhere to solid substances, such as submerged rocks or timber, as has been suspected by some authorities. The experiment made had resulted in determining that the eggs were non-adherent, and sunk to the bottom of the water immediately on exclusion. A remarkable feature of these eggs was their excessively small size, they not exceeding individually a millimetre in diameter, so that over 600 might be contained in a single even layer having the dimensions of one square inch. As compared with the eggs of the salmon and trout it had been observed that the developing embryo occupied a much larger portion of the cavity of the egg, the yolk sac being almost completely absorbed in the liberation of the young fish. There is in consequence no semi-inactive or "alevin" stage with this species as found in the trout and salmon, the fry on emergence being remarkably slender and buoyant and swimming actively towards the surface of the water. A more exhaustive technical paper upon the development of this species was promised by Mr. Saville-Kent at a later date. The success he had obtained in the culture of the several hundred fry then in his possession made him altogether sanguine concerning future operations that would be undertaken of rearing them on an extensive scale for the re-stocking of our Southern rivers.

Mr. Sprent laid on the table some copies of a geological map of Tasmania, prepared at the Crown Lands department The work was initiated at the request of the Hon. N. J. Brown, Minister of Lands and Works, and was intended to accompany the "Crown Lands Guide" issued by the department. It has frequently been represented to the Government that Mr. Gould's maps and reports should be republished for general information, but as to do so would entail a great amount of unnecessary labour, it was decided to embody Mr. Gould's work in a general map, and to incorporate therein all the most reliable information obtainable from other sources. Mr. Sprent, finding that Mr. R. M. Johnston was independently engaged upon the preparation of a descriptive account of the geology of Tasmania, agreed to join forces with that gentleman. Several gentlemen, on being consulted, agreed to give information, but a great difficulty was experienced in reconciling statements, it was determined to prepare a map from the materials at hand, and then distribute it amongst those who were likely to take an interest in adding to and correcting it. The map now issued does not claim to be a reliable record of ascertained geological facts; it is put forward rather as a guide, and as an incentive to further work in the same direction; there being no complete geological survey of Tamania, it is impossible to attain to more than approximate accuracy. The authors therefore offer this map as their contribution towards a future and more elaborate work. It will be found to give a clear and fairly accurate delineation of the leading geological features of the colony as far as it is possible to delineate them upon a map of small scale.

Mr. Johnston is now engaged upon the letterpress portion of the work, but as it is necessarily a work of his spare hours it will not be ready for some months yet.

In the meantime Mr. Johnston and Mr. Sprent will be grateful to any gentlemen who will furnish them with information that may be made available for another edition of the map.

Mr. E. D. Swan exhibited an albatross' egg Diomeda exulans. This egg was collected during the cruise of the Erebus and Terror at Campbell Island, lat. 52deg. 33min. S., long. 169deg. 9min. E., in the year 1840; weight, 17¼oz.

The Curator drew attention to a beautiful mounted specimen of a *copper*-headed snake of Victoria. This specimen had been captured by

Mr. E. D. Swan at Phillip Island, and he had it mounted and presented to the Museum. Attention was also drawn to a very pretty variety of an albino morepork, Podargus cuvieri, caught at Brighton.

On the table were exhibited three specimens of the brown trout, Salmo fario, caught at the Great Lake, their weight being 15, 14, and 13lb. respectively.

A specimen of quartz from Mount Morgan, Queensland, was shown.

### SPECIAL MEETING.

At a special meeting, which was held on the same evening, an alteration of a formal character was made in rules 24 and 27, to enable meetings of the Council to be held without the presence of the hon. secretary, which has hitherto been held essential, and altering the date of the first meeting for the session.

## MAY, 1885.

The monthly meeting of the Royal Society of Tasmania was held on Tuesday evening, 12th May, Mr. James Barnard, V.P., in the chair, and several ladies were present. A very large number of Fellows were present. The following gentlemen, who had been previously nominated by the Council, were balloted for, and declared duly elected as Honorary Members of the society, viz. :—The Hon. William Macleay, F.L.S., M.L.C., etc., Edward Pierson Ramsay, F.R.S.E., F.L.S., etc., etc., Curator Australian Museum, Sydney. In proposing the former gentleman the hon. secretary (Dr. Agnew) referred to him as one of the first naturalists in the colonies, to whom they were indebted for very many favours. To the trustees of the Australian Museum and Mr. Ramsay, he said, they were under special compliment for valuable additions to their Museum. Mr. Ramsay had it in his power to be serviceable to them, and he had always exercised it in their favour. It was to the Trustees and him they were indebted for the valuable collection of New Guinea and other birds which were displayed on their table that evening.

### A HANDSOME DONATION.

The **Chairman** said he had, on the part of the council, to make the gratifying announcement to the Fellows of the society that since their last meeting they had received from the executors of the late Dr. Joseph Milligan a legacy of £350, which was to be devoted to furthering the various objects of the society. (Applause.) Although it was nearly 30 years since Dr. Milligan quitted Tasmania for Europe, he had nevertheless taken a vivid interest in the affairs of the society, and this had culminated in his final act of bequeathing such a handsome legacy to the institution he loved so well. (Applause.) Those who had the privilege of enjoying the intimate acquaintance of Dr. Milligan while he was secretary of this society would remember the zeal with which he threw himself into the advocacy of the building of the museum. Through his instrumentality a large subscription was obtained, and the Government having given the site, which was originally part of the old Government House grounds, the present handsome building was the result. His zeal in the cause of science was well known. The first portion of the published transactions of the society were almost exclusively occupied with his report on the coalfields of Tasmania, which might even now be referred to with advantage by any one desiring to inform himself of the extent of the coal deposits in Tasmania. On all occasions Dr. Milligan had shown himself a lover of science, and in promoting the objects of this society especially. He (the chairman) would only point the moral by saying that such a life and example were worthy of all imitation. (Applause.)

The hon. secretary (Dr. Agnew) brought forward the usual returns, viz.:—

1. Number of visitors to the museum April—On Sundays, 960; on week days, 1,160; total, 2,120.

2. Number of visitors to Royal Society's Gardens. April—5,500.

Seeds received at the Royal Society's Gardens during the month of April, 1885:—

From the Botanic Gardens, Madras, 16 packages seed.

From the Botanic Gardens, Saharanpur, N.W. India, seeds (Abies dumosa).

4. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during April, 1885:—

8th. Chinese Chrysanthemums commence to flower.
10th. Elm leaves commence to fall.
12th. Coe's fine late red plum commence to ripen.
15th. Pyrus Ancuparia leaves commence to fall.
24th. Black Mulberry leaves commence to fall.
28th. Seeds of Hornbeam ripe.

Meteorological Returns.

From the Government Observatory, Captain Shortt, R.N., table of observations for April, from Mr. F. Abbott.

Superintendent Royal Society's Gardens, register of rainfall for April.

Additions to the library during the month of April.

Adelaide University Calendar for the year 1885. From the University.

Agricultural Gazette, March 9, 16, 23.

American Agriculturist, March, 1885.

Annals and magazines of Natural History, March 1885.

Bombay magnetical and meteorological observations for 1883.

Bulletin du Musee Royal D'Histoire, Naturelle de Belgique, Tome iii., 1884, No. 1.

Bulletin de la Societe Royale de.

Botanique de Belgique, Tome Vingt. From the Society.

Descriptive notes on Papuan Plants. From Baron F. von Müeller, K.C.M.G.

Epinal glossary, Latin and old English of the eighth century, photo.-lithographed from the original M.S., by W. Griggs, and edited with transliteration, introduction and notes by Henry Sweet, M.A. From the Chief Secretary of Tasmania.

Fac-similes of the declaration of independence, and the treaty of Waitangi, New Zealand. From the Rev. Geo. Clarke.

Forest culture and eucalyptus trees, by Edward Cooper.

Fragmenta Phytographiæ Australiæ, pt. 2. From Baron F. von Müeller, K.C.M.G.

Gardeners' Chronicle, Feb. 28, March 7, 14, 21, 28.

Geological Magazine, March.

Index Perfectus ad Caroli Linnæi. Species Plantarum, Nempe Earum From Baron F. von Müeller, K.C.M.G.

Journal of Science, March.

Memoirs of the Geological Survey of India, vol. xxi., pts. 1, 2. (Palœontological Indica). Series xiii., vol. 1, pt. 4. Salt Range Fossils, by W. Wagen, pt. D., 1. Productus Limestone Fossils, iv. Brachiopoda, with plates, lviii., lxxxi. From the Geological Survey Department of India.

*Medical* Press and Circular, March 18, 1885.

Monthly notices of the Royal Astronomical Society, vol. xlv., No. 4., February, 1885.

Monthly Weather Report of the Meteorological Office, London for November, 1884.

Nature, vol. 31, February.

Organic Constituents of Plants and Vegetable Substances and their Chemical Analysis, by Dr. G. C. Wittstein, translated by F. von Müeller, F.R.S. From Baron von Müeller, K.C.M.G.

Proceedings of the Geographical Society of Australasia, New South Wales and Victorian branches, with maps and illustrations, 1st session, 1883-4, vol. 1. From the Society.

Prodromus of the Zoology of Victoria, decade x., by Professor McCoy. From the Government Printer, Victoria.

Preussische Statistik, lxxix. From the Statistisches, Berlin.

Quarterly Weather Report, pt. 1, 1877. From the Society, London.

Tasmanian Statutes, vol. 4. From the Government.

Victorian Naturalist, March and April. From the Society.

Vital and Meteorological Statistics for April. From R. M. Johnston, Government Statistician.

Wattle Bark Report of the Board of Enquiry.

### PRESENTATIONS TO THE MUSEUM.

### Mammals :

Two Black Opossums, Phalangista fuliginosa, Mr. J. McCluskey.
A Black Rat, Antechinus swainsoni, Dr. Coverdale.
Tiger Cat, Dasyurus maculatus, Mr. C. S. Agnew.

### Birds :

New Holland Goshawk, Astur novæ-hollandiæ, Mr. Headlam.
Swamp Parakeet, Pezoporus formosus, Mr. Tabart.
Lewin's Rail, Rallus Lewenii, Dr. L. Holden.
Australian Gannet, Sula Australis, Mr. P. Seager.
Eagle Hawk, Aquila audax, Mr. ——
Native Companion, Grus Australasianus, Mr. Facy.

Crachypus

### Fishes :

Two Salmon, Salmo salar (male and female), from the River Erne, Ireland, from the Salmon Commissioners, Tasmania.

Tasmanian Jack or Pike, Lanicoperca mordax, Mr. R. M. Johnston

### Insects.

A Few Insects, Mr. J. McClymont.
A Collection of Beetles. Mr. Moore.

### Shells.

Pecten fumatus, Mr. J. McCane.
A Valve (Limopsis tenisoni), Mr. T. R. Atkinson.

### Old Documents.

One Spanish Dollar, dated Hobart Town, July 10, 1823 (paper).
A Two Spanish Dollar, dated Hobart Town, March 25, 1823 (paper).
Paper Money, value 2s. 6d., Dr. E. J. Crouch.

### Papers.

The continuation of the Hon. W. Macleay's paper, "Zoology of Australia."

A paper by Mr. R. M. Johnston, F.L.S., entitled "Notes regarding the Silurian Fossils of the Gordon Limestones, with generic descriptions and a specific list of the organisms already named and classified."

Mr. Johnston's paper contains a brief history of the silurian fossils obtained from the Gordon limestones of Tasmania. Although 28 species have been named and classified by Mr. Salter, over 17 years ago, no descriptions of the species have yet been placed upon record, and hence the collection of fossils now in the society's Museum, originally obtained by the late Dr. Milligan, and supplemented by Mr. Chas. Gould in the year 1862, cannot be identified specifically. Mr. Johnston has arranged with R. Etheridge, jun., F.G S., of the South Kensington Museum, London, to have Mr. Salter's collection fully described, and to facilitate reference in the meantime, among other particulars, the former has given a full description of the various genera, with a complete list of the species already named.

Mr. R. A. Bastow read a paper "On the identification of Tasmanian mosses, etc " The paper was intended to illustrate a hand-book on the Tasmanian mosses, a compiled list of all the genera he (Mr. Bastow) had prepared from Hooker's Flora Tasmaniæ and other authorities of our mosses. The book was beautifully illustrated, and would be valuable to those who took an interest in the mosses to determine the genera they belonged to.

Mr. R. M. JOHNSTON bore testimony to the value of Mr. Bastow's work, saying that it would be of great assistance to anyone commencing a study of the mosses. No part of the world was so favourable to such a study as Hobart, in the vicinity of Mount Wellington.

Mr. C. H. GRANT said the thanks of the society were due to Mr. Bastow for his paper on this most interesting branch of the study of botany. No one could enter a mountain glade in Tasmania without seeing how particularly rich they were in mosses. England had been considered rich in them, but here they were in far greater luxuriance and beauty, and a hand-glass was quite sufficient to enable them to be fully inspected, without the aid of a microscope. If only a few people would apply themselves to the study here, new species would, he was sure, be very soon discovered. (Applause.)

A paper "On some new species of Tasmanian marine shells," by W. F. Petterd, C.M.Z.S., was read by the hon. secretary, Dr. Agnew.

### Exhibits.

The Paradise birds, presented by the trustees of the Australian Museum, were a theme of admiration for their rich and exquisite colouring, and reflected great credit on Mr. J. A. Thorpe, the head taxidermist of the Sydney Museum, who had mounted them, and no doubt will prove a highly interesting addition to the museum.

Mr. Bastow exhibited, by the aid of the microscope, some beautifully mounted specimens of Tasmanian mosses, which proved of great attraction to the members present.

Lieut. C. E. Beddome stated that no doubt the Fellows were aware of the large shipment of salmon ova which had arrived during the last few days, and which had been deposited at the Ponds, and he was happy to inform them that about 50,000 eggs were alive and looking well. Accompanying the ova, was sent out two fine specimens of salmon, a male and female, which had been admirably preserved and mounted by Mr. Morton, the curator. The two fish were exhibited during the evening, the male weighed 30lbs., the female, 23lbs.

Votes of thanks to donors to the Museum, to authors of the papers read, and the chairman, brought a very pleasant evening to a close.

## JUNE.

The monthly evening meeting of the Royal Society of Tasmania was held on Tuesday evening, June 9th, Mr. James Barnard, Vice-President, in the chair. A large number of Fellows were present, as well as several ladies. The following gentlemen, who had been previously nominated by the Council, were balloted for and declared duly elected Fellows of the Society, viz., Messrs. Alexander Macdonald Ritchie and T. B. Moore.

### DR. MILLIGAN'S BEQUESTS.

The **Chairman** said that at their last meeting he had the gratification of announcing the receipt of certain pecuniary bequests by the late Dr. Milligan to the Society. He was not then aware that in addition to those bequests Dr. Milligan had also made certain gifts of land, comprising three allotments of one acre each at Bicheno, and one town allotment of three acres at George Town. No doubt these would be of considerable value to the Society. In connection with this he would also say that the Council had thought that the best way to make acknowledgment of these liberal bequests would be to have a likeness of the deceased gentleman suspended in the Museum. They were indebted to Mr. Sprent for the enlarged photograph which they possessed, and which was on the table for the inspection of members. It was a very excellent likeness, as all those who knew Dr. Milligan would recollect.

The photograph, which had been enlarged in the Crown Lands Department, was handed round for the inspection of members.

The Hon. Secretary (Dr. Agnew) brought forward the usual returns, viz.:—

1. Number of visitors to the museum during the month of May:—Week days, 1,372; Sundays, 1,000; total, 2,372.

2. Number of visitors to Royal Society's Gardens during the month of May, 5,600.

3. Plants and seeds received at and sent from the Royal Society's Gardens during the month of May, 1885:—

From the Acclimatisation Society, Queensland, case containing 25 plants.

From Mr. G. Brunning, St. Kilda, Victoria, case containing 45 plants.

From Baron Ferd. Von Mueller, Victoria, 135 packets seeds.

From Dr. R. Schomburgk, Adelaide, 25 packets South Australian seeds.

To Messrs. Law and Somner, Melbourne, 2 bags sphagnum moss.

To Mr. John Smith, Riddel's Creek, Victoria, 2 bags sphagnum moss

4. Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during May, 1885:—

14th. Dutch medlars, commencing to ripen.
16th. Diosma alba, commencing to flower.
18th. Photini serrulata, commencing to flower.
20th. Ailanthus glandulosus, leaves all shed.
25th. Laurustinus, commencing to flower.
31st. Jasminum nudiflorun, in full flower.

### Meteorological Returns.

From the Government Observer, Captain Shortt, R.N., table of observations for May.

Additions to the library during the month of May:—

*Agricultural Gazette*, March 30, April 6, 13.
*American Agriculturist*, April.
Annals and Magazine of Natural History, April.
*Athenæum, The*, January, February, March.
Catalogue of the Passeriformes, or Perching Birds, in the collection of

the British Museum, "Fringilliformes," Pt. 1, containing the Families Dicæidæ, Hirundinidæ, Ampelidæ, Mniotiltidæ, and Motacillicdæ. Vol. X. By R. Bowlder Sharpe. From the Trustees of British Museum.

Den Norske Nordhavs Expedition, 1876-78. XII. Zoologi, "Pennatulida," by D. C. Danielssen and J. Koren. XIII. Zoologi "Spongidæ," by Dr. G. A. Hansen. Christiana, 1884-85. From Prof. H. Mohn,

Entomologisk Tidskrift, April, 1884

*Gardeners' Chronicle.*

*Geological Magazine*, April.

*Journal of Science*, April.

Journal of the Royal Microscopical Society. Vol. 5. Pt. 2. April.

Monthly Notices of the Royal Astronomical Society. Vol. 45. No. 5. March.

*Nature.* Vol. 31. March.

New Zealand Journal of Science. No. 8 and 9. March and May.

Proceedings of the Academy of Natural Sciences of Philadelphia. Pt. III. Nov., Dec., 1884.

Primer of Tariff Reform, A. By D. A. Wells. From the Committee of the Cobden Club, London.

## PRESENTATIONS TO THE MUSEUM.

### Mammals.

Two Tasmanian Tigers, Thylacynus cynocephalus, male and female, Messrs. French Bros.

One do. Tiger, do. do., male, Mr. F. Mace.

A Platypus, Ornythorhynchus paradoxus, Mr. W. E. Shoobridge.

Flying Squirrell, Belideus sp., Mr. T. Oakley.

### Birds.

Little Penguin, Eudyptula minor, Mr. F. Selfe.

Grey-tailed Thickhead, Pachycephala glaucura, Mr. G. Hinsby.

Tasmanian Honeyeater, Meliphaga Australasiana, Capt. E. T. Wallack.

### Fishes.

Native Freshwater Perch, Microperca Tasmaniæ, Mr. J. Swan.

Parrot Fish, Labrichthys sp., Mr. R. M. Johnston.

### Coins, etc.

1 Swedish krona, a 25 ore, a 10 ore, a 4 skilling (1842), a 5 cent., a dime, 2 Egyptian pennies. Specimen from the Bitter Lakes. Part of the keel of the Vega, Capt. Nordenskiold, Sub-Inspector O. Hedberg.

### Papers.

"Notes on the discovery of new species of leaf impressions from the Tertiary sandstones at Mount Bischoff, belonging to the genera Eucalyptus, Laurus Quercus, Zamia, etc." By Mr. R. M. Johnston, F.L.S.

In Mr. Johnston's paper he describes a number of new species of very interesting leaf impressions obtained by Mr. Kayser in sinking through Tertiary sandstone beds, which underlie the recent basalt at Mount Bischoff as it does at Breadalbane, One-Tree Point, Geilstone, and other places in Tasmania. Mr. Kayser is highly commended for his services to science in this matter, as he has by his painstaking energy added considerably to our knowledge of the Tertiary Flora of Tasmania. In the collection made by Mr. Kayser, Mr. Johnston recognises at least 10 new species belonging to the genera Eucalyptus, Quercus, Laurus, Ulmus, Zamia, and possibly the genera Lomatia, Ceratopetalum, and Ficus, are also represented. This, according to the writer of the paper, is most interesting, as it substantiates the opinions advanced by Baron von Ettingshausen and Baron Sir Ferd. von Müeller, that the whole existing vegetation of the world can in its development be traced to an universal flora in bygone geologic ages, and, therefore, in perfect accord with the evolution hypothesis. It is strange to observe that the prevailing forms of vegetation in Tasmania during the Tertiary period should be more closely allied to the existing flora of Europe than to the existing flora of Tasmania.

Mr. Johnston states that the species of Eucalyptus from Mount Bischoff named by him E. Kayseri, is the first indication of our most characteristic vegetation (the gum tree) which he has yet observed in a fossil state in Tasmania. Quercus, so abundantly represented in a fossil state at Mount Bischoff, is now restricted entirely to the Northern Hemisphere.

A Paper, entitled "The Tasmanian Earth tremors 1883-4-5," by Mr. A. B. Biggs, which was replied to by Captain Shortt, and Messrs. R. M. Johnston and W. H. Knight.

The following note on the determination of the coal plants of Tasmania, by Mr. T. Stephens, was read:—Some five years ago I submitted to the notice of the Royal Society specimens of Glossopteris, Gangamopteris, Noeggerathbiopsis, with other forms not yet fully identified, from the Mersey coal measures, and shortly afterwards a fine collection from the same beds was presented by Mr. Hainsworth, of Latrobe. At the time of the Calcutta Exhibition I sent a box of specimens from the same locality, together with a few from the Jerusalem basin, to Dr. Ottokar Feistmantel, Palœontologist of the Geological Survey of India, who is thoroughly conversant with the flora of all the Australian coalfields, and better able than any other living authority to settle questions concerning the relative age and affinities of the coal measures of Tasmania. In the correspondence which has followed, Dr. Feistmantel expressedhis readiness to determine for us the species of our coal plants, and thus facilitate comparisons and conclusions which at present are necessarily made very much in the dark. In a letter received by the last mail he says: —"I don't want to publish anything about the subject before I have got again your opinion about the position of the Mersey beds in reference to the marine fossils. I intend, then, to publish figures and descriptions of the fossils you have sent: for this purpose I would be much obliged to you for any other fossils from the coal measures of Tasmania which you might be able to communicate to me, so that my memoir on the plant fossils of Tasmania might be more complete. When I wrote my first notices on the Australian fossil flora I had no sufficient information about the occurrence of Glossopteris in Tasmania." It is a long time since I have had any leisure to dovote to the collection of geological specimens, and those which I possess from the southern and eastern coal measures are mostly in a fragmentary condition, having been obtained hurriedly from roadside cuttings, or the *debris* of coal workings, while traversing the country on horseback. I am, however, able to supply Dr. Feistmantel with a good collection from the Mersey basin, and shall be glad to do any thing in my power to send him one representing the other coal formations in Tasmania. If any of the Fellows of the Royal Society are willing to help in this direction, and will either send specimens to the Museum, or furnish the names of local collectors from whom they can be procured, they will materially aid in the accomplishment of an important work, which cannot be performed except by the transmission of a good representative collection to a competent authority.

### EXHIBITS.

Mr. James Andrew produced a specimen of rock from the Kimberley district in South Africa in which the diamonds are found.

Mr. F. Belstead, of Launceston, sent a specimen of fossil wood obtained in the Ringarooma district.

[illegible]

Mr. [illegible]
[illegible]

[illegible]
Mr. [illegible]

The Hon. Secretary, referring to the
Members of the Society, of the Hon. W. M
Sydney, and E. Pierson Ramsay, Esq., F.R.S.
the Sydney Museum, said he had sent them comp
to the fact, and that it had since been noted in

VOTE OF THANKS.

On the motion of Colonel Legge, seconded
vote of thanks was passed to the donors of ex
papers.

EXHIBITION OF MOSSES

Mr. R. A. Bastow, with the aid of the mic
interesting collection of specimens of Tasma
greatly admired.

A vote of thanks to the chairman concluded

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## JULY.

The monthly evening meeting of the Royal
held on Tuesday evening, Mr. James Barnard,
the chair. There were fifty-six Fellows in a
present being the Bishop of Tasmania (Dr.
Chief Justice (Hon. W. R. Giblin), and several

Dr. A. Bingham Crowther and Mr. R. R. Re
of the Society.

To Mr. G. Brunning, Melbourne. Box cuttings.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during June, 1885 :—

12th. Maelaura aurantiæa, leaves falling.
15th. Iris alata, commencing to flower.
18th. Calycanthus prœox, in full flower.
20th. Crocus vernus, commencing to flower.
22nd. Common privet, leaves falling.
30th. Black mulberry, leaves all shed.

### METEOROLOGICAL RETURNS.

From the Government Observer, Captain Shortt, R.N., table of observations for June.

Additions to the library during the month of June :—

*Agricultural Gazette*, April 20, 27, May 4, 11.

*American Agriculturist*, May and June.

American Museum of Natural History. Annual report of the trustees for the year 1884-5.—From the Trustees.

Annals and Magazines of Natural History, May.

Auckland Institute and Museum. Report for 1884-5.—From the Trustees.

*Athenæum, The*, April.

*Bulletin du Musee Royal D'Histoire Naturelle de Belgique, Tome* III., IV., No. 3, 4, 1885.—From the Trustees.

Catalogue of the Fossil Mammalia in the British Museum, pt. 1, containing the orders Primates, Chiroptera, Insectivora, Carnivora, and Rodentia. By Richard Lydekker, B.A.K.

Catalogue of the Lizards in the British Museum, 2nd Edt., vol. 1, Geckonidæ, Eublepharidæ, Uroplatidæ, Pygopodidæ, Agamidæ.—From the Trustees British Museum.

Elephant Pipes in the Museum of the Academy of Natural Science, Davenport, Iowa, 1885, by Chas. Putman.—From the Trustees.

Gardener's Chronicle, April 25, May 2, 9, 16.

Geological Magazine, May.

Guide to the collection of Fossil Fishes in the Department of Geology and Palœontology, British Museum (Natural History), 1885.

Guide to the Galleries of Mammalia, Mammalian, Osteological, Cetacean, in the Department of Zoology in the British Museum, 1885.—From the Trustees.

Journal of Science, May.

Meteorological Observations, November, 1884.—From the Meteor. Office, India.

Midland Medical Miscellany, Vol. 4, No. 41.—From the Editor, Leicester, England.

Monthly Weather Report of the Meteorological Office, London, for December, 1884.—From the Meteor. Office, London.

Monthly Notices of the Royal Astronomical Society, Vol. 45, No. 6, April, 1885.—From the Society.

Nature, Vol. 31, April.

Principles of Forecasting by means of Weather Charts, by the Hon. R. Abercromby.—From the Meteorological Office, London.

Proceedings of the Canadian Institute, Toronto, 3rd Ser., Vol. III., Fas. No. 1, March 1885.—From the Society.

Proceedings of the Linnean Society of New South Wales, Vol. X., Pt. 1, June 1885.—From the Society.

Records of the Geological Survey of India, Vol. XVIII., Pt. 2.—From the Geological Survey Office.

Report of the Acting-Secretary for Mines and Water Supply, Annual, Victoria, 1884.—From the Mines Department.

Report of the Meteorological Council to the Royal Society for the year ending 31st March, 1884.—From the Meteorological Office, London.

Results of Astronomical Observations made at the Melbourne Observatory in the years 1876, 1877, 1878, 1879, 1880.—From the Government Astronomer.

Results of Rain and River Observations made in New South Wales during 1884.—From the Government Astronomer.

Scientific Transactions of the Royal Dublin Society, Vol. III., Series II., IV. Catalogue of Vertebrate Fossils, from the Siwaliks of India, in the Science and Art Museum, Dublin, by R. Lydekker, B.A. Plate and Woodcuts.

Scientific Transactions of the Royal Dublin Society, Vol. V., on the origin of Fresh Water Faunes, a Study in Evolution, by W. J. Sollas, M.A.

Scientific Transactions of the Royal Dublin Society, Vol. VI.—Memoirs on Coleoptera, of the Hawaiian Islands, by the Rev. T. Blackburn, B.A., and Dr. D. Sharpe. Plates IV. and V.

Scientific Proceedings of the Royal Dublin Society, Vol. IV., N.S., July 1884, Pt. V.; Vol. IV., N.S., January 1885, Pt. VI.—From the Royal Dublin Society.

Transactions of the Royal Historical Society.—New Series, Vol. II, Pt. IV.; 1885.—From the Society.

Transactions and Proceedings of the New Zealand Institute.—Vol. XVII., 1884.—From the Trustees.

## PRESENTATIONS TO THE MUSEUM.

### Mammals :

Two Grey Opossums, Phalangista vulpina; Three Black Opossums, Phalangista fuliginosus; Two Ring-tailed Opossums, Phalangista viverrina, Mr. W. Lester.

Two Tasmanian Tigers, Thylacinus cynocephalus; One Tasmanian Devil, Sarcophilus ursinus, Mr. W. Turvey.

Duck-billed Platypus, Ornithorhynchus anatinus, Mr. John Swan.

Two Ring-tailed Opossums, Phalangista viverrina, Mr. T. M. Atkinson.

Ring-tailed Opossum, Phalangista viverrina; Golden-bellied Beaver Rat, Hydromys chrysogaster, Mr. A. Brent.

### Birds :

Two Musk Ducks, Biziura lobata, Mr. R. Read.

Blue Crane, Ardea novæ hollandiæ, Mr. L. Massey.

Mandarin Drake and Duck, Aix galericulata; Javanese Pheasant, Phasianus sp., Mr. E. D. Swan.

Ten species of American Birds' Eggs, Mr. Geo. Hinsby.

### Fishes :

Tail of an Indian Stinging Ray, Mr. W. H. Buckland.

### Crustacea :

A Hermit Crab, Pagrus sp., Mrs. John McCance.

### Relics, Etc. :

A Paper, *The Saunders News Letter*, Friday, May 16, 1777, Dublin, Mr. J. F. Echlin.

Two Swedish Coins, Mr. L. O. Laroson.

## WATER AND TYPHOID.

Mr. W. F. Ward, A.R.S.M., Government Analyst, read the following paper on the Impurities of Water in Relation to Typhoid Fever :—

At the request of the sanitary officer of the Launceston Corporation I have, at different times, examined 11 samples of water collected by him during his enquiries into outbreaks of typhoid fever ; to the results obtained I shall refer later on, only stating now that they show painful neglect of the simplest necessary health precautions; some of the figures are given in the table before you, also analyses of Hobart and other waters for comparison. In dealing with my subject, the considerable outside interest, and I am sorry to have to add ignorance, which attach to it must be my excuse for repeating and emphasising many points with which you are already familiar, but the knowledge of which is not so widespread as it should be. I propose to begin with the impurities found in different classes of water, to define the conditions which a really good natural water should fulfil, and to point out some means which may be employed for the improvement of a bad or suspicious water, in cases where no other supply above suspicion is by any means obtainable.

## Foreign Matters found in Waters.

Chemically speaking, no water found in nature is pure; the impurities are very various—gaseous, liquid, and solid, organic, and inorganic—some beneficial, some harmless, some deadly in their effects when introduced into the human body; but the word "impurity" for our present purpose may be taken to mean something objectionable either in itself, in its origin, or its excessive quantity. The gaseous constituents of natural waters are mainly oxygen, nitrogen, and carbonic acid, all present in the air, and beneficial or harmless; small quantities of carburetted hydrogen in marsh waters, and sulphuretted hydrogen with its unmistakable smell like rotten eggs in some mineral waters. The usual mineral or inorganic constituents are lime, magnesia, potash, soda, and ammonia, with sometimes iron, manganese, or alumina, combined with chlorine, sulphuric, carbonic, and nitric acids, in some cases also nitrous, silicic, and phosphoric acids; forming chlorides, sulphates, carbonates, nitrates, nitrites, silicates, and phosphates.

Not one of these substances is, in itself, injurious, if in small quantity; but the amounts of ammonia, nitrous and nitric acids, and chlorine are used with other results of analysis in forming an opinion as to the purity or otherwise of the water under examination, while anything more than the most minute trace of phosphoric acid is considered a certain indication of sewage contamination.

The more or less poisonous metals, arsenic, lead, copper, and zinc are sometimes found, derived either from minerals in the rocks, or from pipes and tanks. The use of zinc-coated or galvanised tanks has been discontinued in the French navy on account of the action of water in dissolving zinc. The remaining constituents found in water are various kinds of organic matter, that is, matter of animal or vegetable origin, both dissolved and in suspension; the suspended matter is in part dead and decaying, the remainder consisting of innumerable minute living organisms of many kinds, sometimes including water-fleas and worms, and the ova of parasitic worms of men and animals, and almost always some forms of fungi, algæ, etc., or infusoria, the immense variety of the last named class being shown in Mr. Saville-Kent's wonderful manual lying before you. Amongst the fungi are classed the schizomycetes, minute, mostly colourless cells or threads, globular, in short rods, or straight or spiral filaments embracing the various species of bacterium, bacillus, spirillum, micrococcus, vibrio, etc., they include the smallest organised bodies known, and as a class may be said to measure from 1-150th to 1-15,000th of an inch, they multiply in two ways, either by the splitting up of one into two or more individuals, or by the coalescence of two organisms into one, followed by the production of spores which develop in to the parent form. Most of these species must be considered harmless, if we take into consideration their world-wide distribution, both in air and water, and the fact that they, as well as the other impurities mentioned, with the exception of the parasitic ova, associated as they too frequently are with excrementitious matters, are daily swallowed by millions of people without apparent ill effect; indeed Pasteur has suggested that they may render material aid in the vital process of digestion. Some of them act the part of scavengers, causing the putrefaction or decay of dead organic matter; others, however, are accepted as the undoubted causes of such diseases as anthrax or splenic fever in cattle, cholera in fowls, and a form of typhoid in pigs: less generally, but yet by some of the highest authorities, consumption, cholera, and typhoid fever in man are considered to have been proved at least within a measurable distance of certainty to be due in each case to the presence and multiplication in various parts of the human body of a specific bacillus; some of these specific germs, or perhaps their spores, finding a resting place in a suitable subject, and reproducing as an accompaniment of its own enormous multiplication each its special disease, and apparently no other.

The bacillus tuberculosis is pretty firmly established; the battle still rages over the "comma bacillus" of Dr. Koch, attributed by some to segments of the spirillum, while comparatively recently Dr. Gaffky has found in various organs of the human body after death from typhoid a special form of bacillus which was absent in only one case out of 28 examined.

It is also claimed that diphtheria, ague, leprosy, relapsing fever, pneumonia, small-pox, scarlet fever, etc., in fact all diseases hitherto classed as zymotic, as well as several others, are caused by the presence in the body of specific forms of these schizomycetes, derived either from air or from water, the latter being undoubtedly the chief agent in disseminating typhoid fever.

The presence in water of minute organisms, in most cases, as I before said, harmless, but occasionally deadly, may be shown by growing them in various culture or cultivation fluids in which appropriate chemical substances are dissolved, they multiply enormously in a few days, rendering the clear fluid milky, and some of them can then readily be examined microscopically. The serum of blood, the aqueous humour from the eye of an ox, slices of half boiled potato and beetroot, and other substances, have also been used, but the best method by which their presence may be rendered apparent to the naked eye is by mixing the water with melted gelatine jelly in a tube, adding a very small quantity of phosphate of soda, allowing the jelly to set, and stand protected from air germs by cotton wool for some days. Each point of life multiplies and forms round it, either a sphere of liquid, or a gas bubble, and in this way different waters may be compared, at least so far as quantity or intensity of life is concerned, and so far as our present limited knowledge goes we may assume "the fewer the better" a general rule. Strong sewer water does not show globules, but the whole mass becomes turbid, and liquifies from above downwards.

The mode of action of the disease germs has been variously supposed to be either a struggle for existence with the vital cells of the animal body, death following if the function of the parts invaded be destroyed; the formation of poisonous matter in the fermentation produced by them; or mechanical obstruction of the capillaries by millions of them blocking the circulation.

### Definition of Good Water.

Water for human consumption ought to fulfil all, or at least as many as possible, of the following conditions:—It should be almost, if not entirely, free from—(*a*) Floating matter, whether finely divided earth or organic matter, either animal or vegetable living or dead and decaying. (*b*) Dissolved animal or vegetable matter, or more than a moderate quantity of dissolved mineral matter. (*c*) More or less injurious or poisonous metals in appreciable quantity, such as lead, copper, zinc, *arsenic*, or iron. It should have no corroding or dissolving effect on the first-named metal; and it should not contain more than two parts of iron or zinc, or one part of lead or copper, in a million parts of water. It should be free from the slightest suspicion or possibility of contamination with sewage or drainage or foul gases of any kind, from houses, cesspools, church yards, slaughter yards, tanneries, farm yards, manured fields, etc. No sediment should form on standing, and only a moderate amount on boiling. It should be moderately cool and well aerated, containing seven or eight cubic inches of dissolved gases per gallon, two cubic inches at least being oxygen. Such water will be entirely free from taste, smell, and colour; soft, clear, bright, and transparent, and entirely wholesome and palatable.

## Classes of Water.

Rain-water in falling takes from the air traces of nitric acid, ammonia, mineral and organic matter, including the germs of animals and plants; and if collected from the roof of a house, will sweep into the tank much additional impurity, as the droppings of birds, dust, decayed leaves, zinc from gutters, etc. Some of these germs are the producers of fermentation, putrefaction, and sometimes, doubtless, of disease.

Springs may contain excess of mineral or vegetable matter, or poisonous metals. Lakes and ponds or water-holes will contain various impurities, according to position and the source from which they are fed, but usually yield water inferior to good river water. Rivers may receive drainage from manured land, pastures, houses, farm yards, etc., and thus contain the germs of various diseases of men and animals, and of intestinal worms and other parasites; or sheep may have been washed in them. Wells frequently receive leakage from cesspools, farm yards, etc., and may be much polluted, although the water remains perfectly clear, bright, and tasteless. Marsh water usually contains much vegetable matter, and has a "peaty" taste.

## Purification.

Tanks and barrels used for storing, and filled from any of these sources, are liable, if not frequently emptied and cleaned out, to become foul from the accumulation of sediment, and the possible presence of drowned rats, mice, and insects, and the absorption of foul gases from neighbouring cesspools, pigstyes, stables, etc.; water in this condition also dissolving greater quantities of harmful metals, as lead, copper, and zinc (from galvanised iron) with which it may come in contact. In addition to frequent cleansing of store tanks and barrels, it is always advisable to use a filter, which, if efficient, will retain suspended matter and the larger organisms, including the ova of fluke, tape, and other intestinal worms, and some of the dissolved albuminous matter will be oxidised; but many of the minuter forms of life, including the dangerous ones, will pass through an ordinary filter. I mention this not to discredit filters, but to prevent too implicit reliance being placed upon them.

Boiling for some time, either without, or, better, with the addition of a very small quantity of permanganate of potash, is necessary if the quality be doubtful; but it is much safer to obtain, if possible, a supply quite free from suspicion, as it is not certain that all dangerous germs will be destroyed even by boiling, the spores of some forms bearing a still higher temperature.

Filtering, especially through a dripstone, will re-aerate the water after boiling, and so remove its insipid flavour. The dripstone should of course be out of reach of noxious gases from ill-kept yards, etc. Filters should be cleansed every two months by pouring through a quart of pure water containing 30 grains of permanganate of potash, and 10 drops of strong sulphuric acid (oil of vitroil), then two to four gallons of pure water containing a quarter to half an ounce of pure hydrochloric acid (spirits of salt), and followed by a like quantity of pure water only; the filter is then again fit for use. If the filter contain charcoal which can be taken out, this may be first boiled in water containing a little permanganate of potash, and then baked in an oven. Unless cleansing be regularly carried out, the organic matter accumulated on the filter may render the water of worse quality than it was originally.

Very hard water containing large quantities of lime and magnesia salts may be rendered more fit for drinking by boiling, with the addition of a very small quantity of carbonate of soda, it is softened, its medicinal effect destroyed, and some of the organic matter also carried down by the precipitate formed. Lime water will have a similar effect in cold water, if the hardness be due to carbonates, while recent experiments show beneficial results in organically impure waters from the addition, to each gallon, of two grains of dissolved alum. It is advisable, however, not to rest content with purified water if by any possible means an originally pure supply can be obtained.

RESULTS OF ANALYSES.

| Source of Supply. | Grains per Gallon. | | Parts per Million. | |
|---|---|---|---|---|
| | Total Solids. | Chlorine. | Free Ammonia. | Albuminoid Ammonia. |
| CRESSY. | | | | |
| 1. Creek supplying Cressy | 6·02 | 0·42 | 0·10 | 0·19 |
| 2. Ditto ... ... ... | 5·60 | 0·52 | 0·12 | 0·18 |
| 3. Marsh draining into Creek ... .. .. | 6·72 | 0·59 | 0·29 | 0·37 |
| 4. Tank of house (fever case) .. | 10·50* | 0·77 | 0·61 | 2·20 |
| 5. Barrel (next door to No. 4) Filled from creek. | 7·70 | 0·35 | 3·20 | 3·14 |
| 6 Tank in neighbourhood .. | 4·06 | 0·77 | 0·69 | 0·27 |
| 7. Lake River ... .. | 7·00 | 1·68 | 0·21 | 0·13 |
| EVANDALE. | | | | |
| 1. South Esk River .. | 6·5 | 1·08 | 0·01 | 0·13 |
| 2. Nile Creek (Gutteridge's) .. .. .. | 14·5 | 0·46 | 0·10 | 0·13 |
| 3. Ditto (common supply) | 5·5 | 0·46 | 0·07 | 0·09 |
| 4. Well, near graveyard.. | 33·0 | 10·80 | 0·08 | 0·20 |
| For comparison :— | | | | |
| A. Dr. Hassall's proposed Standard for greatest allowable impurity .. | 14·17 | — | 0·05 | 0·10 |
| B. London Water Supply (Thames) .. ... .. | 18·5 | 1·2 | 0·01 | 0·06 |
| C. Thames, London Bridge | — | — | 1·02 | 0·59 |
| D. Effluent from sewage... | — | 9·9 | 16·20 | 0·90 |
| E. Hobart supply, taken the day after heavy rain had succeeded drought | 7·28 | 0·70 | 0·02 | 0·11 |
| F. Cascade Brewery Reservoir .. .. .. | 3·92 | 0·56 | 0·01 | 0·09 |
| G. Ditto, Diamond Drill | 65·03 | 23·82 | Trace | Trace |
| H. Well, near Green Ponds .. ... .. | 86·80 | 29·00 | — | — |
| I. Well, near Emu Bay .. | 6·02 | 1·02 | 0·40 | 0·23 |
| K. Rain Water (tank near drain) ... .. ... | 3·92 | 0·21 | 0·12 | 0·16 |
| L. Cascades Reservoir ... | — | — | 0·01 | 0·11 |
| M. Tap in Laboratory ... | — | — | 0·005 | 0·07 |

*Sediment, in addition to dissolved solids, 51·8 mineral matter, 11·2 organic matter.

Nitrogen as Nitric and Nitrous Acids :—Evandale. —1., 0·25 ; 2., 0·11 ; 3., 0·10 ; 4., 21·41. A., 0·90 ; B., 3·50 : H.. Traces.

## EXPLANATORY NOTES TO TABLE OF ANALYSES.

Nitrogen is present in considerable quantity throughout the bodies of animals, and in smaller quantity in plants, chiefly in the fruits and seeds ; consequently the estimation of nitrogen, found in the three forms of free ammonia, nitrogenous, or albuminous organic matter, and nitrous and nitric acids, forms the most important part of the analysis of drinking water.

Free ammonia, present in larger proportion than 0·08 part per million of water, is usually due to the decomposition of urea, showing that admixture with urine has occurred. The average amount of free ammonia in river waters is 0·01 part per million, but this is subject to some variation. Albuminoid ammonia is formed in the process of analysis employed, and represents approximately ten times as much living or dead nitrogenous organic matter. A water yielding more than 0·15 part of albuminoid ammonia is considered to be unfit for drinking purposes. Imperfectly filtered water yielding 0·10 - 0·29 part per million is stated to frequently produce diarrhœa. Nitrous and nitric acids are formed by the oxidation of nitrogenous matter, and have been described as the "Skeleton of Sewage," and as representing "previous sewage contamination ;" but the term "old organic matter" seems more appropriate, the nitrogen not being of necessity originally derived from sewage, but possibly from other contaminating matter. The admixture of sewage, etc., may, however, have been quite recent. A good water will contain no nitrous acid. In ordinary cases the total solids consist chiefly of dissolved mineral matter, which in small proportion is unobjectionable ; but in some spring and well waters are found excessive quantities of lime, magnesia, and soda salts (chlorides and sulphates), which render them wholly unfit for every-day use. Water containing more than eight grains per gallon of lime and magnesia salts is stated to be injurious to many persons, but in limestone districts a much greater proportion is always present.

The proportion of chlorine in natural waters varies greatly, but as it is always found in some quantity in urine and sewage, the knowledge of the amount, considered with the other results of analysis, may be of some assistanc in forming an opinion as to purity.

## NOTES ON SAMPLES EXAMINED.

### Cressy.

Samples 1 and 2, taken from creek supplying Cressy. Colour brownish, from finely divided matter in suspension ; living organisms present.

Sample 3, taken from marsh draining into creek about 100 yards above spot where Nos. 1 and 2 were taken. Milky, from the presence of much suspended matter, the quantity being sufficient to render the water opaque when seen in a layer of about 9in. in depth. A farm-yard and privy drained into the creek near the point where the marsh joins the creek.

Sample 4, taken from tank of house where typhoid fever had occurred. Water orignally taken from creek. Colour, brownish yellow, sediment amounting to 63 grains per gallon, about 52 grains being mineral, and the rest organic filth, swarming with life, including worms.

Sample 5, from tank or barrel next door to house where sample 4 was taken. Water originally from creek. Colour brownish yellow, slight turbidity, offensive smell, contained portions of insects, much organic matter, sporules, etc.

Sample 6, from tank or barrel in neighbourhood, filled from creek. Colour faintly yellow, slight sediment, and living organisms, including worms.

In the case of Nos. 4 and 5, and to a less marked extent in No. 6, water, originally impure, appears to have been from time to time added to store tanks or barrels which were never cleaned out—a filthy mixture, dangerous at all times, and especially so with disease in the vicinity, being the result.

Sample 7. It is to be regretted that the water from the Lake River should have been influentially defended in the Press in a letter from which the two following extracts are taken:—"A friend of mine from Queensland . . . laughs at the idea of it being unfit to drink after seeing the stagnant water of that colony;" the river being just previously described as ". . . flowing through a large grazing as well as a marshy country which carries a large quantity of stock, the excrement of which is washed into the streams."

Evandale.

Samples 2 and 3, taken from Nile Creek. The results obtained show a perceptibly greater amount of impurity in No. 2 than in No. 1. The creek was fuller than usual when the samples were taken, and this probably rendered the results more favourable.

Sample 4, from well near graveyard, has probably received both sewage and the drainage from the graveyard. Its immediate closing was strongly recommended.

Very great care is necessary in making deductions from the results obtained, and no single standard for comparison has been or can be adopted, the general characters of the water of the particular districts when obtainable being the best guide.

A. This "standard" was proposed some years ago as showing the greatest allowable amounts of various impurities in drinking water, and it is of course desirable that they should fall as much below this as possible.

B. C. That portion of the London water supply which is taken from the Thames is usually considered to be more impure than is desirable, and various proposals have been made to replace it at enormous expense by water brought from places hundreds of miles distant. The river at London Bridge is proverbially impure.

D. Effluent sewage after removal of all solid matters by filtration.

E. This sample of Hobart water was coloured brown with vegetable matter, and was taken from an ordinary house-tap the day after a long-continued drought had been succeeded by heavy rain. The loss of residue on ignition amounted to 4·2 grains per gallon, which may in this case be considered to fairly represent the total organic matter, chiefly of vegetable origin, present in the water.

F. This water contained only a small quantity of vegetable matter in suspension, and the analysis was made on the unfiltered water. The total mineral matter amounted to 2·9 grains per gallon.

G. Total solids and chlorine in considerable quantity; two-thirds of the former consisting of chloride of sodium (common salt) and chloride of potassium, the remainder chiefly of lime and magnesia salts; very small amounts of ammonia and nitric acid, not accurately determined.

H. Chloride of magnesium and other salts of lime and magnesia present in sufficient quantity to produce medicinal effects.

I. The water of this well had evidently been polluted by surface drainage.

K. Contained various living organisms and their ova; mineral matter 2·8 grains per gallon.

Comparative experiments made in cultivating the minute forms of life in the Hobart and Evandale waters showed them to be most numerous in the first-named and the South Esk waters, and least so in the well water. No conclusions can, however, be drawn from these or similar results at present, in the absence of knowledge as to what are dangerous or harmless forms.

### CONNECTION BETWEEN IMPURE WATER SUPPLY AND SPREAD OF DISEASE.

Typhoid fever is spread by the contamination of water or air by a specific poison derived from the discharges of infected persons, and there is little doubt that this poison consists of living germs, although they have not yet been absolutely identified. The disease may be due to—

1. Percolation of liquids containing these germs, sometimes to a considerable distance, through the soil into wells and springs or underground tanks, or discharge of sewage into rivers.
2. Exhalations from ill-trapped closets, perhaps connected with house cisterns, defective sewers and privies, etc., containing germs derived from patients; water or milk stored in the immediate vicinity may in this way be rendered dangerous. When exhalations issue into the air they are stated to be immeasurably more likely to communicate disease than is the atmosphere which immediately surrounds fever patients.
3. Contamination of milk, and also possibly of spirits, by admixture with germ-polluted water; the disease is said to have been spread in one case at least by the use of bad water for washing the milk-cans. The popular belief in the absolute protective action of spirits, even in immoderate proportion, is a dangerous delusion.

The following cases of the spread of typhoid fever by water are instructive, and can scarcely be too frequently quoted:—

1. Three hundred and fifty-two persons suffered from typhoid fever, the cause being conclusively proved to be the accidental addition to the water of a small amount of excrement from a sick man who worked for a time in the deep wells supplying otherwise pure water to a large district. Such minute admixture would defy detection by chemical or any other means known at present.
2. A case of typhoid fever occurred in a cottage on the banks of a Swiss mountain stream, which below the cottage flowed for some distance underground; the water, etc., taking two to three hours to reach a village some distance lower down, the cour e and rate of flow being ascertained by throwing in opposite the cottage about a ton of salt. A still larger quantity of flour was afterwards thrown in and well mixed with the water; none of it reached the village, showing that tolerably efficient filtration, which entirely stopped the flour, allowed the germs of typhoid to pass in sufficient quantity to communicate the disease to 17 per cent. of the population.
3. The town of Croydon was supplied with water obtained from deep wells sunk inside the town; these were lined with iron cylinders for a certain distance from the surface to shut out the subsoil water which was known to communicate more or less with the sewers; water from the wells was frequently analysed, but no results pointing to defilement could be obtained until the level was lowered by pumping, and samples of the water trickling through the sides of the wells collected and examined, the movement of the subsoil water being also traced by chemical means. Undoubted sewage contamination was discovered, a sufficient reason for the fact that one person in 42 living in the Croydon water district suffered from typhoid fever, as compared with one in 809 in the district immediately outside, although in many cases the same sewers were used in common by the two districts. The well yielded 0·04 part, and three samples of the leakage 0·14, 0·26, 0·22 parts of albuminoid ammonia per million.

The cases in which this disease has been spread by wells found to be in communication with cesspools are very numerous.

Unfortunately, neither the microscopist, the physiologist, nor the chemist can give a definite answer as to the freedom from disease germs of any water, or, save outside rather wide limits, pronounce an opinion as to its probable unwholesomeness, the difficulty in the latter case being much greater if no history of the supply and its surroundings, and no knowledge of the general character of the waters of the surrounding district, be available.

The safest plan is to consider no water to be fit for human consumption into which sewage has entered, or can at any time enter; and the best test of safety to carefully trace the supply to its source and ascertain that no objectionable impurity gains access to it in its course.

Water mixed with sewage may be, and has been, usde for a long time with apparent impunity; but the greater the pollution the greater is the liability to receive sooner or later the germs of typhoid and other diseases, the nitrogenous matter furnishing material for their multi plication, and possibly also, by lowering the general health, preparing the way for their attack.

The slightest admixture of these germs with the purest water having been conclusively shown to be most dangerous, it is manifestly of the highest importance that the supply of towns should be preserved from risk of contamination by the prohibition as far as possible of all settlement on the gathering grounds, while that precaution, as in this colony, remains a comparatively easy matter. This matter has received much attention in Victoria with very beneficial results.

An originally pure supply may be fouled in the mains by leakage through defective joints when the water is turned off, or the pressure is insufficient to reach the higher ground. The partial vacuum produced in the empty pipes by continued drawing in the lower parts of the distric, would greatly facilitate the entrance of surface water.

The necessity for the utmost care in thoroughly disinfecting all discharges, etc., from a typhoid patient cannot be too frequently insisted on, and full directions as to the best means to be employed are given in the "Rules" issued by the Government; this precaution should be continued for two or three months, as it is stated that a patient is capable of communicating the disease during that period of convalescence. The burial of excreta recommended should be carried out as far as possible from wells.

Other germ diseases, notably cholera, may be spread through the medium of water; and, even in the absence of specific germs, an undue proportion of organic filth is injurious to health, and consequently predisposing to disease.

The typhoid germ finds in excreta a most suitable seed bed for its propagation, and in the words of Parkes:—

"The occurrence of typhoid fever points unequivocally to defective removal of excreta, and it is a disease altogether and easily preventible;" in other words, it is like diphtheria, a "filth" disease.

Tyndall says, on the general question of germ diseases:—

"The physician and the sanitarian have no longer to fight against phantoms, requiring only the fortuitous concourse of atoms to bring them into existence. Their enemy is revealed, and their business is to thwart him, to intercept him, and to slay him; it is not noxious gases, but organised germs, which, sown in the body, and multiplying there indefinitely at the body's expense, produce the most terrible diseases by which humanity has been scourged. Contagia are living things. Men and women have died by the million that bacteria and bacilli might live. These virulent organisms, these ferments of disease hang about the walls, the furniture, and the clothing of the sick room. How is this room to be disinfected? They are diffused in the air of our drains (hence the mystic power of sewer gas). How is that air sufficiently noxious on its own account to be prevented from entering our houses? We know how typhoid fever is generally spread. How are our water and milk to be protected from that contagion? Our hospitals, it is said, infect their neighbourhoods. Is not this preventible?"

While Pasteur says :—

"Man has it in his power to cause parasitic diseases to disappear off the surface of the globe, if, as we firmly believe, the doctrine of spontaneous generation is a chimera."

Having now done with general considerations, let us consider our own case.

The original purity of a water from such a superb gathering ground as Mount Wellington may be to some extent counteracted if the channel by which it is distributed be not carefully construeted, and a watch kept both as to settlement on this gathering ground and along these channels. I propose to indicate shortly a few points which can only be regarded as blemishes on what should be an almost perfect supply; small, perhaps, some may say fanciful, but in my opinion not desirable, either from a sentimental or a sanitary point of view.

On one side, the Fern Tree Inn and a cottage are not far removed from the covered troughing, which just below them runs through a shallow cutting in a vegetable garden, and on the upper bank of this cutting manure is heaped, possibly all the year round, while on the reservoir dam stands a house, the ground sloping down from it to the edge of the reservoir. On the other side water is brought for some distance in an open channel parallel with and below the Huon-road, from which it probably receives rain washings; from the small reservoir it flows unconfined down the hill-side, spreading over much ground covered with vegetation, until it reaches an open channel, unprotected for hundreds of yards from the drainage from steeply sloping paddocks on either side, some ploughed, others much used for pasture, all heavily manured, directly or indirecly, passing then through the busy brewery yard to an uncovered reservoir by the side of and below a much frequented road.

The effects of this treatment are shown in analyses marked L. and M. in the table, M. being a mixture of the waters from both sides; the increase of impurity, looking at the quantity only, is extremely small, but it indicates the possibility of risky contamination in the future. (Applause).

Mr. R. A. BASTOW stated in reply, that they were all deeply indebted to Mr. Ward's able paper, and would like to call the attention of the Fellows to the maps and diagram on the wall, as they bear on the subjects of typhus and typhoid fever. The City of Manchester is divided into a number of registration sub-districts, and these are again divided into sanitary districts, the maps of two of their sanitary districts are there hung, and it will be at once perceived that they contain very differently arranged properties; they are two districts, and each represents one-ninety-ninth part of the city of Manchester. In 1881 there was not a single case of typhus or typhoid fever in the sanitary district tinted with green and blue, its streets are wide and straight, every house has its own earth or ash-closet and yard, and the drainage of both yards and streets is not to be excelled in any city in the world. The other map, tinted red and brown, contains old houses, with numerous courts and alleys, along these the health inspectors are continually perambulating, but notwithstanding their watchfulness, typhus and typhoid fever often there prevail to a great extent. In the year 1881 in this small district there were 20 cases of typhus and typhoid fever, resulting in five deaths; the population being only 3,955, against 10,305 in the neighbouring healthier district just alluded to. From this we conclude that, given old brick drains, ineffective stench traps, close courts, dirty rooms, and a filth-loving population, we have a pabulum favourable in a high degree to the development of typhoid and typhus fever. That an outbreak of such fever can be effectively stamped out, we need only point to the pen and ink diagrams to prove. It is drawn to the scale of 100 deaths per inch vertical, the column of greatest height respecting the deaths from typhus and typhoid fever in 1868 for the whole city, viz., 638; these gradually diminish for the subsequent years until we reach 1881, in that year only 75 deaths occurred from typhus and typhoid fever in Manchester. Glancing at the diagram, if it be asked, What made so great a change in the mortality from fever? The reply is—The removal of 16 acres of cesspool, 4ft. deep, the thorough cleansing of many miles of ill-swept streets, courts, passages, and yards, partially covered with decomposing animal and vegetable matter; the closing of burial grounds in the city; the condemnation of private slaughter houses; and the removal of emanations from drains. Nevertheless, cases of typhus and typhoid fever still occur in that well-regulated city, and will continue so to do as long as a certain grade of the population will congregate in the dark corners, and by choice be filthier than brutes. The drinking water of Manchester has been pronounced very good by eminent analytical chemists, but it is patent to all who visit the locality referred to, that the population is of the lowest stratum, and their habits are of the filthiest. The dirty, drinking, gossiping women inhabiting such a district as that shown on the brown coloured map, can, with the assistance of the milkman, sow the infection broadcast. May not the germs of typhus and typhoid fever be the bacilli or bacteria left high and dry from the sewers, or raised from that thin native noisome element by evaporation, and before they have time to be otherwise affected by the atmosphere, find a congenial hotbed for propagation in the systems of ill-fed, ill-clothed, ill-housed, and ill-washed humanity? According to their environment, do these germs develop sometimes into animal, and at other times into vegetable forms. (Hear, hear.)

Mr. R. M. Johnston said he had himself on a former occasion drawn attention to some of the supposed causes which led to the rise and fall of the death rate in Tasmania, and now Mr. Ward had brought forward another one, namely, the pollution of the waters. The care that should be exercised in regard to the state of the water they drank could not be overestimated, and should not be neglected in any respect. He had been very sorry to see that in some of the thinly populated districts there was great neglect on this point, especially in the neighbourhood of the tributaries of the great local rivers. In the bends of the river he had seen animal skins lying, and various matters connected with tanneries. In the South Esk he had seen animal matter largely carried into the river, which might, at some future time, cause very great injury to the community. Notwithstanding the value of Mr. Ward's paper, he did not think the discovery of the nature of the typhoid germ had been fully explained. There was an unknown cause, an inexplicable wave movement, which obtained much greater power at one time than it did at another, the deviation being accompanied by no apparent cause. These difficulties did not show that the conclusions come to already were of no value, but how difficult a matter it was to settle if there were something else hidden behind those conclusions. Why, for instance, should the death rate have gone up so suddenly in 1878, the year referred to by Mr. Ward; and why, again, last year with a probable increasing impurity in the water did the rate fall to a lower level? This wave action was felt while the local influences were the same. With regard to Mr. Ward's experiment, they required to know whether the germs he had developed was the typhoid germ, or whether it was harmless. He was inclined to think they were so, and that in this room bacteria germs were floating about in large quantities (—laughter)—and would develop themselves in the proper medium if it were present, so they must inquire if the germs found in the water came from the air or from the water itself originally. It was very significant that Mr. Ward had shown that the liquidity of the substance commenced from the top. It was possible, therefore, that the germs were imported from the air. So they should look and see that the germs did not fly hither and thither through the town in the air to the injury of weak persons. Mr. Johnston drew special attention to the immunity from disease, which was the rule in Tasmania, and showed by diagrams that the death rate, in its entirety, and as regarded zymotic diseases alone, was less here than in either of the other colonies.

Dr. A. B. Crowther said though he had not come to the meeting with any intention of speaking he thought it only right that as a medical man he should give the assistance to the society which lay persons could not do. Mr. Ward had already pointed out some of the evils which existed in the colony, and what Manchester, for instance, had done in order to remove abuses, and the example ought to be followed in Tasmania. When he was resident in Campbell Town some years since, an outbreak of typhoid was distinctly traceable to the way in which the waters of the Elizabeth were dammed up, and now they were made to flow freely there was no such danger. In Launceston typhoid was no doubt owing to the presence of the burial grounds within the town boundaries, draining towards the centre of it, and to the presence of cesspools, some of which had not been emptied for years. He had done his best while he resided there by lecturing and in other ways to get these things remedied, and had pointed out how much better Hobart was than Launceston in having the cemeteries outside the city. There could be no question that when they got a proper system of dry earth closets the cesspools would be done away with altogether. Year by year they found typhoid arising in the same place over and over again, showing that there were the *foci* from which the disease spread. He thought that typhoid and typhus should be placed in the general wards of the hospitals, as was the rule in the old country, and as there was no danger of subjects adjoining becoming affected. In relation to the question of the filtration of water, he would say that water ought to be filtered over gravel beds and sand. This would help to do away with many childish diseases, such as worms. They knew very little about the relation of worms to the human body as yet, but something might be done in the way he had indicated. It was very important that the public should be instructed in the use of disinfectants. Sulphate of iron was very cheap and effective in assisting to destroy the germs.

Dr. Perkins said he had not prepared any remarks for the meeting, as he was unaware of the nature of the paper to be delivered. A great deal of it was not new, but it was true, and none the less interesting. One was almost inclined to say with Lyon Playfair, that he was inclined to eat and drink everything, and ask no questions at all. It was an almost superhuman task to eradicate everything that was bad. But still Dr. Playfair had been converted, and so he hoped they might be in a similar manner. In reference to the destruction of germs, he would point out that it was now known that disinfectants would not destroy some bacilli. The bacilli of cholera, for instance resisted them, and the only way in which some of them could be disinfected was by drying them, and even then, if they were again moistened, they were reanimated. The only way to kill them was to make them perfectly dry, and keep them so. In that way they were taught not to use *disinfectants indiscriminately* in all cases, or to use much washing and cleaning, but to expose the clothing, etc., of cholera patients to the sun and air. They could not go on using one fixed line for everything. He would have liked to have seen the question of the origin of typhoid in the colonies gone into at this meeting. Dr. Thompson, of Melbourne, had gone into it very thoroughly. Were the germs brought to the colonies by passengers in ships, or had they been present in the world from the beginning of all creation, ranking with the first origin of all things? Was it that the germs were not noxious—things to be hated—and not merely things for the transmission of disease to man, but having their own proper rank in the scale of creation? Was the fact of the transmission of disease by them a mere accident, or the result of man's own fault? That would of course open up the question of spontaneous generation. Bacteria and bacilli were present everywhere throughout the world, and the greater part of man's immunity from their influence was due to his powers of resistance. In regard to Dr. Crowther's remarks about typhoid patients being allowed to mix with the other patients in a hospital, he would like any medical man to show him what advantage could accrue from doing so, instead of keeping them distinct, as they did here. Even allowing the disease to be neither contagious nor infectious, what advantage would be gained by putting them with the other cases? As they knew, typhoid was disseminated from the excreta, and if that was to be carried about up and down stairs, a great risk would arise from it. They would need better reasons than had been given before they changed the plan which the medical officers here thought it wise to pursue. He was quite sure there were exceptions, and in London and in Edinburgh the typhoid patients were kept apart, and for his part, he hoped they always would be. (Applause.)

Mr. **Ward**, in answer to Mr. Johnston as to the germs in his liquids coming in from the air instead of being developed from the water, pointed out that the wool at the mouth of the tubes would act as an effectual filter; and further, that he had treated distilled water in a similar fashion, and no germs had been developed. He had not intended by his attention to this subject to imply that there was any particular prevalence of typhoid in our midst, but rather to, if possible, reduce the quantity still lower, and to do his best to arrive at the conditions sketched by Pasteur. Their immunity in the past was not due to any particular care in guarding against evil. All they had to do in regard to food and drink was not to do as Dr. Playfair said, but to see that they got a good supply; to be careful that they got it pure, and then to think of it no more than was necessary to keep it in good order. In regard to the introduction of typhoid into the colonies, that might have occurred on board ships by carelessness in the filling of water casks, either here or on the way home. He saw a case of this description reported only the other day, where every member of a ship's crew was prostrated, owing to the bad quality of the water at the last port of call. (Applause.)

The **Curator** read a paper by Baron F. Von Mueller, K.C.M.G., entitled, "Notes on Jean Julien Houton Labellardiere, botanist of the search expedition sent out under Admiral D'Entrecasteaux to ascertain the fate of Count La Perouse and his crew." The paper was accompanied by a photo-lithograph of Labellardiere, a copy of which will be inserted in the proceedings of the society for the year.

## NOTES AND EXHIBITS.

Mr. C. J. **Atkins** read some notes on the sea-worm Synapta, illustrated by Polarized Light. He said: The class Echinodermata includes the marine objects known as sea-hedgehogs, sea-urchins, and sea-eggs. The members of the group generally develop a calcareous skeleton (set with spines) as an outer covering or integument. The body is globose or cylindrical, and a ring of nerve branches issues from the mouth. The genus of this class called Synapta are cylindrical in form, the body being traversed by an alimentary canal, and the mouth is surrounded by a fringe of radiate feelers, which are the ends of the nerve system of the animal, and serve the purpose of drawing in its food. A skeleton of calcareous plates exists below the tough outer skin, and embedded in these plates are curious anchor-like appendages, which protrude through the skin, giving a rough or rasp-like appearance to the worm. The anchors are used both as an assistance to the Synapta in its movements, and for fixing itself in the mud or sand ; they are attached to the anchor-plates, and are immovable. The Synapta is common on the coast of the south of France, and on other shores of the Mediterannean, also in those of the Red Sea. Dr. Herapath mentions the species galliennii as being obtained by him at Torquay, England. (Quart J. Microscopy, 1865.) It is generally found in burrows in the sand, and is difficult to collect as a perfect specimen, owing to its dividing into separate pieces when handled. The anchor-like spiculæ and plates appear as very brilliant objects when polarised, and I have placed under the microscopes specimens of them this evening.

Mr. Saville-Kent, in reply, said : I have much pleasure, in illustration of the paper last communicated, in exhibiting to the society living examples of the genus Synapta, dealt with by Mr. Atkins, and also of a yet rarer, but closely allied form belonging to the genus Chirodota. These specimens were obtained by me a few days since when dredging between Kangaroo Point and Ralph's Bay. This locality I may refer to as being remarkably rich in representatives of the same animal class, the Echinodermata, no less than thirteen distinct species, including members of all five of the leading sections or orders of this interesting group having been secured. These embraced three members of the sea-cucumber order, or Holothuridea ; three varieties of ordinary starfishes, or Asteridea; two sorts of brittle stars, or Ophiuridea ; four species of sea urchins, or Echinidea; and several examples of feather stars, or Comatula, representing the Crinoidea, or fifth order of the class. A very remarkable feature is associated with the genus Chirodota, to which I would more particularly draw attention. This organism is an elongate worm-like animal, of a violet hue, possessing an oral tuft of retractile tentacles, as in Synapta, and, like that type, the substance of the integument is strengthened by the development within it of innumerable calcareous plates. These plates are of a very peculiar form, taking the shape of beautifully symmetrical six-spoked wheels, and having interspersed among them, at more or less distant intervals, hook-like spines, which evidently fulfil the same function as the anchor-like spicules of Synapta. The species obtained in the Derwent estuary differs from the more familiar European species (Chirodota violacea), in the minute structure of the calcareous "wheels," and in their general outline, which more nearly approaches a hexagon than a perfect circle. Writing of the European species in his book, "The Microscope and its Revelations," Dr. Carpenter has characterised Chirodota as differing from Synapta in the entire absence of anchoring spicules. This diagnosis must, however, evidently be modified with relation to the Tasmanian variety. My recent study of living examples of these two genera has shown that their method of feeding is precisely identical with what obtains in the large and more familiar representatives of the same group, known as the Sea-cucumbers or Trepangs. The manner in which these last-named animals took their food long remained a mystery, and was solved by me in connection with specimens cultivated at the Manchester Aquarium in the year 1875. A correspondence upon this subject will be found in the pages of *Nature* for the year 1884.

It was then observed that the plumose tentacles that surround the mouth are systematically swept like mops or brushes over the surface of all objects with which they came in contact, and all minute organic particles that can be detached are carried off and thrust bodily with the tentacle down the creature's throat. The tentacle is then withdrawn and extended to repeat the mopping process, all the other tentacles following suit in almost rhythmical order. This feeding process here described may be witnessed in the relatively small species of Chirodota now exhibited. Under a higher power of the microscope I also exhibit the remarkable wheel-shaped plates and hooklets that underlie the surface of the integument. Among the practical results derived from my recent examination of the Holothurians I have to record one fact which I regret to say somewhat detracts from the admiration hitherto conceded to their aspect and structure. A friend (Mr. Mackay) having suggested to me that a large assortment of the minute shells known as foraminifera might be obtained from their intestines, I dissected and examined several specimens, with the view of ascertaining what varieties they obtained for food on this coast. Foraminifera were found in abundance, comprising chiefly the genera Miliola, Rotalia, Textularia, and an arenaceous form allied to Reophax. There was also a large variety of diatoms, and the main bulk of the food material of these holothuria may therefore be said to consist of the simplest animals and plants, or protozoa and protophytes. There was a small residuum of food matter, however, that had to be relegated to a much higher organic group. This consisted of the shells of exceedingly minute bivalve molluscs, which I identified as the embryonic stages of some representative of the cockle tribe. This fact being determined, the suspicion naturally arises that in the sea cucumbers a new enemy of the oyster in the earliest stage of its development has been discovered. The habit of the animal to feed on all minute forms of organic life, including embryonic molluscs, being established, it may be logically predicated that the large sea cucumbers, more especially with their relatively powerful mop-like tentacles, would make a clean sweep of any newly-attached oyster spat that might be adhering to the stones, shells, or other objects over which they creep. How far these deductions are borne out by fact I shall hope to report to you at length on some future occasion. Mr. Saville-Kent intimated that the construction of the marine hatchery and aquarium at his residence being now completed, he would be very pleased at all times to welcome members of the society who would like to inspect it. It would be some time yet before the tanks were sufficiently seasoned to allow of the maintenance of a large stock of marine animals, but they would already, perhaps, find a few things to interest them. (Applause.)

### THE MICROSCOPE.

A most interesting feature of the evening's proceedings was the microscopic exhibition which took place at its close, illustrative, to some extent, of the papers read. There were seven microscopes on the table, five of them binoculars, viz., three of Ross', one of Baker's, and one of Smith's. Mr. Atkins' very fine Ross instrument was used for the display of the various features of the Synapta suriniensis referred to in his paper, their peculiar formation and anchor-like appendages creating much wonderment. As seen in the field of the microscope, these latter have the perfect form of a ship's anchor, and the objects seen under the influence of polarized light display the most brilliant iridescent tints. Synapta and bacteria were similarly exhibited by Mr. Saville-Kent, F.L.S. Some very beautiful mounted specimens of mosses were shown by Mr. R. A. Bastow, among them Andræa petrophila, Sphagnum obtusifolium, Phascum apiculatum, and Fissedens bryoides. Mr. Bastow's paper was postponed until a future evening.

### A CELEBRATED PICTURE.

On the table was exhibited an oil painting of an English salmon by S. Rolfe, the celebrated fish artist, who is familiarly known as the Landseer among fishes. In addition to his contributions to the Royal Academy, he painted many of the casts of salmon and other fish made by the late Mr. Frank Buckland, and exhibited in the South Kensington Museum. Our own museum is also the fortunate possessor of two of these artistically executed casts.

### VOTE OF THANKS.

Mr. JUSTIN BROWNE, in rising to propose a vote of thanks to the authors of papers, and the donors of gifts to the Museum, said that it must be gratifying to the members of the society to note the tone of the papers, and their scientific tendency during the last two years. Previously we used to count our scientific members by ones and twos; now we seemed to be getting more science men amongst us. (Applause.) It might not be known to everyone present that the last speaker, Mr. Saville-Kent, had spent a great part of his life upon a work which had given him a great reputation. The society had this book, which would well repay any time spent in examining it. Another speaker had passed 10 years in Manchester, carrying out sanitary measures, which all civilized people now considered as essential. Such addresses as we had heard to-night would give a tone and a scientific turn to our papers which would add to the society the scientific character which it was presumed to possess under the name of the Royal Society. (Applause.)

Bishop SANDFORD, in rising to second the motion, said that he could say but very little after the able manner Mr. Browne had proposed the vote; he would, however, merely state that he was of opinion much might be done in keeping in check most of these diseases that were so fatal in many cases. (Cheers.) He was glad to see some members of Parliament present, and trusted that what they had listened to this evening would tend to encourage them to vote for strict sanitary measures. (Applause.)

Dr. H. A. PERKINS, in supporting the motion, said that no doubt the Fellows were aware that a Public Health Bill was shortly to be introduced by the Government, but he was sorry to see that the power in some cases to deal with this important matter was to be left in local hands, which, in his opinion, would not tend to work satisfactorily.

The motion was carried by acclamation.

## AUGUST, 1885.

The monthly meeting of the Fellows of the Royal Society of Tasmania was held at the Museum building last evening. Mr. James Banard, Vice-President, occupied the chair, and there were also present the Bishop of Tasmania (Dr. Sandford), the President of the Legislative Council (Hon. W. A. B. Gellibrand), and about 40 other gentlemen.

### NEW MEMBER.

Mr. TURNBULL was re-elected a Fellow of the Society.

### RETURNS.

1. Number of visitors to the Museum during the month of July:—Week days, 2,150; Sundays, 780. Total, 2,930.
2. Number of visitors to Royal Society's Gardens during the month of June, 4,900.

Plants and seeds received at and sent from the Royal Society's Gardens during the month of July, 1885 :—

To Messrs. Shepherd and Co., Sydney. Two bags Sphagnum moss.
To Baron Ferd. Von Mueller. Collection of seeds.
To Messrs. Shepherd and Co., Sydney. Collection seeds.
To Mr. G. Brunning, St. Kilda, Victoria. Collection seeds.
From Mr. S. Purvis, Waratah. Seeds.
From Royal Gardens, Kew, London. Package seeds.
From Mr. G. Brunning. Plant Prunus pissardi.
From Mr. C. Traill, Stewart Island, N.Z. Case containing 38 plants.
From Botanic Gardens, Cape Town. Seeds Pentzia virgata.
From Messrs. Shepherd and Co., Sydney. Case containing 60 plants.
From Botanic Gardens, Bombay. Fifteen packets seeds.
From Mr. C. Purchase, Parramatta, N.S.W. Thirty-six dahlias.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during July, 1885 :—

8th. Eranthes hyemalis, commencing to flower.
18th. Garrya elliptica, commencing to flower.
28th. Almond, commencing to flower.
30th. White mulberry, commencing to break.
31st. Crocus aureus, in full flower.

## Meteorological Returns.

From the Government Observer, Captain Short, R.N., table of observations for July.

Additions to the library during the month of July :—

*Agricultural Gazette*, May 18, 25, June 1, 8, 15, 22.

Annals and Magazines of Natural History, June.

*Athenæum*, May.

*Bulletin de la Societe Imperiale des Naturalistes de Moscow*, tome lx. No. 3, Moscow, 1885.—From the Society.

Cuvier's Animal Kingdom. By H. McMurtrie, M.D. Woodcuts; Lond., 1824.

Class Pisces, arranged by Baron Cuvier, with Supplementary Additions by Edward Griffith and Lieut. C. H. Smith. Woodcuts; London, 1834.

Class Insecta, arranged by Baron Cuvier, with Supplementary Additions to each order by Griffith and Pidgeon, and Notices of New Genera and Species by Gray. Vol. 1 and 2; plates; London, 1832.

Classified Index and Synopsis of the Animal Kingdom, arranged by Cuvier, with Supplementary Additions by E. Griffith. London, 1835.—Mr. J. Backhouse Walker.

Field Naturalists' Club of Victoria, fifth annual report, 1884, list of members, etc.—From the Society.

*Gardener's Chronicle*, May 23, 30, June 6, 13, 27.

Geological Magazine, June. From the Society.

Government Statistician's Report on the Vital and Meteorological Statistics of the registration districts of Hobart and Launceston for July, 1885. From the Government Statistician.

Journal of the Society of Arts, February, March, April, and May, 1885.

Journal of Science, June.

Journal of the Royal Microscopical Society, London, Vol. 5, pt. 3, June 1885. From the Society.

Journal of Science, New Zealand, No. 10, Vol. II., July, 1885.

Meteorological Observations for the month of December, 1884. From the Meteor. Office, India.

*Midland Medical* Miscellany, Vol. 4, No. 42. From the Editor.

Monthly Notices of the Royal Astronomical Society, Vol. 45, No. 7, May, 1885. From the Society.

Monthly Record Meteorological Observations, Melbourne, during February, 1885. From the Government Astronomer.

Nature, May, 1885.

Official No. 52, Quarterly Weather Report. Part 11, 1877. Official No. 54, Hourly Readings. Part 4, 1882. Official No. 57, Metorological Observations at Stations of the Second Order, 1880. Official No. 65, Monthly Weather Report for January, 1885.—From the Meteorological Office, London.

On some New South Wales Minerals (plates). On the Chemical Composition of Certain Rocks, New South Wales (plates). By A. Liversidge, F.R.S., etc.—From the Author.

Proceedings of the Academy of Natural Sciences of Philadelphia. Part I., January, February, March, 1885.—From the Society.

Proceedings of the Royal Society of Queensland. Vol. I., Part II., III., IV., 1884.

Proceedings of the Linnean Society of New South Wales. Vol. X., Part 2nd, 1885.

Revision of the Genus Lamprima of Laterelle, with descriptions of new species. By W. Macleay, F.L.S —From the Author.

Reports of the Mining Registrars for the quarter ended 31st March, 1885. The Goldfields of Victoria.—From the Mines Department, Melbourne.

Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work during the fiscal year ending with June 1883. Part I., Text Part II. Sketches Washington, 1884.—From the U.S. Survey Office.

Statistical Register of Victoria, 1884. Part I. Blue Book.—From the Government Statistician.

Statistics of the Colony of New Zealand for the year 1884. Part I., Blue Book ; Part II , Population and Vital Statistics ; Part III., Trade and Interchange.—From the Government Statistician.

Synonymy of and Remarks Upon the Specific Names and Authorities of Four Species of Australian Marine Shells, originally described by Dr. John Edward Gray in 1825 and 1827. By John Brazier, C.M.Z.S.—From the Author.

Victorian Naturalist, The, Vol. II., No. 3, July.—From the Society.

## PRESENTATIONS TO THE MUSEUM.

### Mammals :

Tasmanian Tiger (Thylacinus cynocephalus), Mr. Dunbabin.

Two Tasmanian Tigers (Thylacinus cynocephalus), Mr. R. Douglas Bethune.

An Albino Ring-tailed Opossum (Phalangista viverrina), Mr. H. Morrisby.

An Albino Grey Opossum (Phalangista vulpina), Mr. G. Edwards.

Two Live Wallabys (Halmaturus bennetti), Mr. Triffett.

Two Skulls of Tasmanian Tigers, the Hon. W. Gellibrand, M.L.C.

### Birds :

Wedge-tailed Eagle (Aquila audax), Mr. L. Wilson.

Wedge-tailed Eagle (Aquila audax), Mr. ———

A More Pork (Podargus cuvieri).

Two Blue-banded Grass Parrakeets (Euphema chrysostoma), Mr. Wilkins.

Spotted Owl (Athene Maculata), Mr. J. R. McClymont.

A More Pork (Podargus cuvieri), Miss Propsting.

Little Penguin (Eudyptula minor), Miss Featherstone.

Fishes :

A Hapuku (Oligorus gigas), Mrs. Cearns.
A Fish (probably a new genus), Mr. T. Stanfield.

Crustacea :

A Crab (Leptomithrax Spinulosus), Mr. ———

Mollusks :

A Cluster of Oysters, adhering to portion of a bottle, from Spring Bay, Mr. J. McCluskey.

Minerals :

Sample of Quartz Conglomerate, from the summit of Cabbage Tree Hill, 460ft. above sea level.

Samples of Friable Quartz, Gold-bearing. Three samples, surface caps of lode, 400ft. above sea level, the Tasmanian mine, Beaconsfield, Mr. J. Davies.

Coins :

A collection of Coins and Tokens, the Hon. Wm. Crosby, M.L.C.
A collection of Coins and Tokens, Mr. Easton.

Framed copy of diploma presented to the Commissioners of Tasmanian Fisheries, by the International Fisheries Exhibition Commission, London, 1883, from the Chief Secretary (Hon. Adye Douglas).

### ABSENCE OF THE HON. SECRETARY.

The Chairman announced with regret the inability of the Hon. Secretary (Dr. Agnew) to be in his place, it being still undesirable that he should encounter the night air. The Curator (Mr. Morton) would officiate in his place.

### PAPERS.

The following papers were read:—

## ICELAND AND THE ICELANDERS,

By the Rev. J. B. W. Woollnough.

1. Iceland is an unfinished corner of the world. Heat force which, after forming the earth's crust left it to cool, and become a home for man, is there still hard at work. Yet Iceland is but just outside the Arctic circle. It is so close that at midsummer on a northern hilltop the sun never sets ; whilst the level of perpetual snow is but 3,000 feet, and the larger glaciers all but reach the sea. In this close embrace of heat and cold lies one of the claims of Iceland to the interest of members of a scientific society. If further apology for this paper be needed, it may be found in the fact that in such a land a race of men has lived for more than one thousand years, never conquered, holding their own, not only against their neighbours, but also against nature at her worst; first discoverers and colonisers moreover of Greenland and of America; possessing a rich literature; and at this day the very best educated people in the world. There is not throughout the island a child of ten who cannot, and who does not, read and enjoy the Sagas of his forefathers.

Of the land first. A few miles from the seaboard, except where the poor pasture struggles up the valleys of the larger rivers, extends inland a desert covering nine-tenths of the whole island, being a tract much larger than all Ireland, and this desert is altogether desolate. In one part 4,000 square miles are covered with one vast white mass of lava mountains, glaciers, and snow-fields. Elsewhere, within it, are isolated black hills standing out of rugged lava fields, barren and waterless, or, it may be, swelling belts of volcanic sand, or again, bare earth ; but where soil is found it is waste, without even the tiny fern frond or willow shrublet which I have sometimes, to my delight, found in the lava cracks, the one witness to the power of life in this great wilderness of death.

Thus only the seaboard of Iceland is habitable, whilst across the desert interior from south to north are three passes, though two are but rarely, and the third not frequently, used. The interior mountain ranges have never been, and probably never can be, explored.

Of the habitable seaboard, but one-third will grow even the coarsest herbage. Only a short distance from Reykjavik, the capital, I crossed wide tracts of bare lava, in one place level, where, I suppose, streams passing over a plain, had cooled evenly; in another, formed of blocks of all sizes, weathered into position like your stony field of Mount Wellington, though the boulders were not commonly so large.

Abruptly from such plains rise black detached conical hills of comparatively recent tufa, or a long flat topped basaltic ridge. The valleys, the wooded glens and gullies, which, running deep into the mountain recesses, make so much the beauty of mountain scenery elsewhere, are altogether wanting in Iceland. In these plains are set lakes, commonly with low shelving banks, and through them rush down the rivers, fed by the snows of the central desert; thus form and colour, two elements of the beautiful, are wanting, and in their place are barrenness and gloom, and yet there is also a great fascination. It arises partly, perhaps, from the stillness, the absence of life, the largeness of the waste, the sense that we look upon the two great forces, cold and heat, at their work on matter so nakedly, so largely, and with such grim results. Something, too, there is in the stimulating dryness of the air, and again in the feeling of separation by so wide a stretch of southern seas from all but this singular land, and equally singular offset of mankind.

The sense of strong contrast formed my first impression of this weird land. Coming on deck early in the morning I found not only that Iceland was in sight, but that we were hugging the shore somewhat closely. An ice mountain towered up 7,000 feet, not far from the shore, and from its lower spurs a wide glacier stream ran down, apparently straight into the sea. One flank of the mountain fell in rugged black precipice until it softened into the grassy bed of an upland valley, where the sun shone on a low farmstead and a large flock of scattered sheep. Yet close on the other flank, almost side by side with the glacier, and yet wider, was a broad stream of lava, which in past ages had sullenly forced its way from some volcanic mountain, hidden inland.

Hitherto I have painted in black and white, but there is yet a third colour marking Icelandic scenery—the yellowish green of the scanty vegetation. Much of this is marshy bog. Where forests once stood are now treacherous tussocky hillocks of rank grass rising out of quaking bog, ground almost impassable for the wayfarer on foot, but which the clever little ponies cross in a quick run without a stumble. The pasture lands where they exist, are left undrained, unworked, and unenclosed to the sheep, saving a few acres about the farmhouses carefully manured, and enclosed within low turf walls. These enclosures are called túns, and here the few head of cattle graze, and the crops of hay are had upon which the prosperity of the Icelanders so largely depends, since it is the only provender they can raise for their beasts. The climate is now so severe that no grain will ripen, and there is but one tree throughout the south, with a few dwarf birch in the north. Here and there on the better land some brushes of willow and birch struggle for life. Sometimes, moreover, the summer in the north will be changed into winter by the drifting in of Greenland ice. Still, the land is not only habitable, but could be made far more

gallop, but usually amble, or move more quic
They will go with a load of 100lbs. some 40 mi
at hopping over lava blocks, discovering the
morass, and that at a fair pace, and grand in
rush of water. They are only puzzled on gc
they are apt to stumble, and, in fording rivers,
The rider must of necessity sit down to the
rides as often without stirrups as with them, gu
his seal skin covered heel than with the bridle.
habit of his people of a constant drumming
beast's ribs. The ponies are the carriers of
them tied head to tail are often met. They are
the last few years, rival sheep as the chief exp

Apart from cattle, sheep, and horses, there a
domestic. There are cats; and dogs not unlik
as Scotch colleys in gathering in the ponies; b
and until lately not even the domestic fowl.
with a few imported reindeer. In hard winte
on a Greenland icefloe, but is very inhospitabl
birds ptarmigan are very numerous, and I saw
snowbirds, all very tame, a characteristic they
long now that the British tourist has made
eider duck, however, is not likely to suffer
anxiety to kill something, as it is protected by
lines its nest with down plucked from the b
robs the nest both of lining and eggs. This i
third time the drake supplies the down, and th
rear their brood in peace. Eider down, as th
coverlet made of it, is very elastic, and I have
riddle—"What is higher when the head is
answer—"An eider down pillow."

Together with ponies, and sheep; wool, eider
fish, some Icelandic spar, and Icelandic moss
aware, the chief exports of the island.

Geologists may be interested in the followi
spar:—"This double refracting calc is foun

which have the dubious merit of a singular persistency. They make their way into the boots, under the trousers, and up the nostrils, until, in my friend's case, the guide, with an Icelander's patient endurance, retired to a lava block, covered his face with his hands, and surrendered.

The only vegetables I saw in Iceland were potatoes and turnips, but although they will ripen they are seldom grown. In sheltered place, there are many wild flowers. I have picked or seen buttercups, violets, forget-me nots, wild geraniums, thyme, dogdaisy, catchfly, seapink, with others whose names I did not know.

Hekla, the Geysers, even the sulphur springs of Kriusivik, have been so often described that it would be an impertinence to say much of them here. Hekla is in every way unworthy of her world-wide fame. Built up of sand and clay, the mountain, like so many more in Iceland, rises abruptly from a plain, a long low flat ridge, 5,000ft. in height, marked by three cones. Hekla is but one of eighteen intermittently active volcanic mountains in the island, and has not even to boast of being the most destructive—a distinction belonging to the Skapta Jokul, which in 1783 threw out a mass of lava greater in bulk than Mount Blanc, greater than has ever been known elsewhere in the world. But Hekla is isolated, can be seen from the sea, is easily approached, and has twenty-five times in the course of one thousand years spread desolation ; circumstances to which she doubtless owes her reputation. Once only did I see Hekla as a thing of beauty, and happily it was for the first time, so that the impression remains as the clearest and most prominent. At Oddi the church and priest's house are built on the edge of a plateau some height above the lava fields Wet, tired, hungry, and thirsty, after riding all day and half the night, fording two rivers, and running a madcap race after midnight over the boulders with an Icelandic farmer, who insisted upon trying issues with "the walking priest," as they called me, I dismounted on the platform before the long line of low-gabled buildings that made the priest's home. It was about two in the morning. Turning round, I saw far away on the edge of the desert plains, through a pure, still, yet dimmed light, that most beautiful atmosphere of an arctic summer night, the white mountain mass, standing out from its azure background. There, alone, and then, she looked worthy of the place men have given her.

The last eruption of Hekla was in 1878, and I ascended the mountain in order to see the new crater formed on one of its outlying spurs. We started on ponies from a solitary farm-house set down amidst some grass land, girt about by a vast level barren plain. Crossing a river, deep-sunk between precipitous banks, after riding some hours over sand and pumice, we tethered our ponies on the only bit of green sward between the farm and Hekla. The ascent was wholly over boulders and lava beds, on which lay a few patches of snow in the sheltered hollows. The lava of 1841, which we skirted, was easily distinguishable by its glossy black appearance, and the knobby vitrification of its blocks. The last arrête is reached by a long narrow ridge, with a somewhat steep fall on either side, across which the wind swept viciously. After reaching the summit, and whilst picking my way up the slope of the crater of '78, one leg sunk suddenly to the knee through a yellow, clayish substance, and with it, when I drew it out, came a considerable outburst of smoke, with an evil smell. I suppose it is owing to the presence of heat close to the surface everywhere, that the crater is not a basin, within which the volcanic force has been exercised. It is rather a large portion of the mountain slope, through which the lava had burst in many places, tossing about the surface soil over a considerable area, This eruption had covered the plain in one direction with new lava as far as the eye could reach, and from it still rose in many places columns of smoke. It did not, I believe, do much damage, but lava streams have at different times and places overflowed some of the richest farmsteads and most fertile pastures in Iceland. The Skapta Jokull lava in 1783, of which I have already spoken, formed two streams, each some forty-five miles long, seven to twelve miles broad, and varying in depth from ten feet to six hundred feet. The greatest depth was reached in the sunken river beds which the lava first filled. In this eruption alone, it is estimated that 1,300 men, 20,000 horses, 7,000 cattle, and 100,000 sheep were destroyed. Some who discussed the cause of the remarkable afterglow last year may not know that the same phenomenon followed the Skapta Jokull eruption ; was speculated upon by Benjamin Franklin, and alluded to by Cowper in the second book of the Task.

Of the Geysirs, I can probably say little that will be new. They spring from a narrow table land, about three hundred yards in length, raised by a few feet above a green marshy plain. This plain is separated by a river from the sandy desert, on the north side of which stretched away the vast snow-covered range of the Lang Jokull. The scene would be utterly desolate but for a farm house nestling under the trap hills which rise behind the Geysers.

The surface of the plateau is formed of reddish white thin layers of silica, deposited by the springs whose overflow of boiling water is running away in numerous tiny channels worn in the white flint floor. Although these springs number nearly one hundred, only three are active, the Great Geyser, the Strokr, and the Little Geyser. The Great Geyser has formed a shallow basin, about sixty feet in diameter, on the top of a coned mound. In the centre of the basin is a hole about ten feet across and eighty-three feet deep, in which the water is always bubbling, whilst frequently it rises a few feet, accompanied by a rumbling noise and a slight movement of the ground. I slept on the mound in the hope of seeing one of the great bursts, but was disappointed. Formerly they came every day or oftener, but now a week or fortnight will pass without one. I was awoke indeed about two a.m. by the swaying of the ground beneath me, and scrambled out of the low tent opening, only to see the water rising a few feet. It was uncanny enough ; the pale clear light over the snowy ranges and desert waste, the still, deathly solitude broken only by the intermittent throbbings of the geyser and the continuous murmur of the overflow trickling down the tiny channels it had formed everywhere in the flint deposits. The water in a great eruption is thrown up about two hundred feet. It is almost tasteless, and, *experto crede*, makes excellent chocolate and tea. An analysis shows that in every eleven parts of sub stance held in solution one-half is silica, about 4·90 soda and its compounds, and the rest alumina. The Strokr is but a poor relation of the Great Geyser, a well hole six feet across perhaps, where some ten feet down the water can just be seen, always seething, groaning, and now and again rising some height up the funnel as if making up its mind for an outburst. It is easy enough to provoke one by throwing in a heap of turf. This we did, and whilst about twenty minutes afterwards I was bending over the water rising at every effort a little higher and again falling, suddenly, with one vigorous protesting groan, up rose a column of dirty boiling water one hundred to one hundred and fifty feet, which I had barely time to escape by hard running. For about ten minutes one outburst succeeded another, each of lessening volume and height, until the Strokr had got rid of the meal we had given it, and contented itself with its accustomed perpetual motion and noisy accompaniment.

*The sulphur* springs of Kriusivik are another witness to great heat *force working* close to the surface. These springs are not without danger to those who visit them alone, as I did. After walking for some hours over such ground as I have endeavoured to describe, my map and compass had brought me within sight of a broad high column of steam rising over some low hills. About me was coarse grass on a reddish clay, and I was about to take a step forward, when, hearing a bubbling noise, I looked down, and where my next footfall should have been was a small circular hole in which the sulphur was boiling, rising from time to time to the surface level. Making for the hillside I soon looked down upon a mud basin about twenty feet across, covered with a steam cloud, and from which came a confused noise of boiling and splashing. When the steam lifted at times I could see the boiling mud rising some six or eight feet into the air. From the lava rock close underlying the white clay and sulphur deposit came small sulphur jets over a considerable area about the central pool. The greatest care is necessary in choosing ground, for in many places a man's weight would break through the thin layer of clay or sulphur crust. An attempt is being made by a Scotch company to work this large surface deposit of sulphur, but the cost of transit has hitherto hindered the success of the adventure.

It will seem strange that even the hardy Norwegian Viking of the ninth century should have sought a home in such a land, but it is certain that in his day the climate was much milder than now. Their Sagas, covering the first four centuries of colonisation, mention both trees and grain crops. At the present day the mean temperature is in the south 47°, in the north 33°, but during the summer, though the latitude of the north is 3° higher, the temperature is about equal. This is said to be owing to a branch of the gulf-stream washing Iceland, with which the rain clouds cross, brought by the prevailing southerly winds. These rain clouds, as they pass over Iceland, meet a falling temperature, and discharge their moisture before they reach the north, so leaving it the larger share of summer sunshine, and enabling its inhabitants to raise the earliest and heaviest hay crops.

I have left myself no time to speak of the remarkable people who for one thousand years have kept up a hard constant struggle with difficulties such as no other race has had to encounter. They have done more. Separated from other men, unhelped by the appliances of modern civilisation, they have in intellectual development kept abreast of, and in some respects surpassed, the most civilised European nations. Their national hymn, set to the same tune as ours, is characteristic of the people, and shows to how great an extent love of country is independent of any beauty or advantage in the country itself. Thus the first verse runs, and with it I conclude this discursive paper:—

Most ancient Iceland,
Best loved fatherland,
Fair mountain queen!
Whilst the sea girdles land;
While men ask maiden's hand;
Sungleams on hillsides stand;
Thou art our Queen.

2. The Split Mosses, Bog Mosses, and Earth Mosses of Tasmania, by Mr. R. A. Bastow. The paper was a continuation of a series of Papers on Tasmanian Mosses that Mr. Bastow is engaged on.
3. Descriptions of some Fossil Leaves from Mount Bischoff, by Mr. R. M. Johnston, F.L.S. The two new fossil leaf impressions described by Mr. Johnston belong to the genera *Taxites* and *Eucalyptus*. The former was discovered by Mr. Thureau at Mount Bischoff associated with clays and in drift deposits underlying the basalt sheet formerly referred to in connection with the Tertiary Leaf Beds at this place. The species has been named *Taxites Thureaui* in honor of its

discoverer. The locality from whence the splendid new specimen of Eucalyptus *(E. Milligani.* Johnston) was obtained is not known, although supposed to be from Tertiary Leaf Beds at Macquarie Harbour, where probably it was discovered by the late Dr. Milligan. It is associated with well known forms in Tasmanian Tertiaries belonging to the genera Fagus, Laurus, Cinnamomum, Magnolia, etc.

### EXHIBITS.

Mr. T. STEPHENS exhibited a specimen of the Coal which had been found at some distance from Longford, on the road leading from that township to Launceston, and near Jordan's Bridge. The existence of coal had been suspected in the neighbourhood for the last 40 years, but it had been left to Mr. Mason, a landed proprietor in the district, to prosecute a search, and he was rewarded by finding a seam which was stated to be 4fft. in thickness. He, Mr. Stephens, thought that these coal measures might be traced from near Hadspen to a place where he had reported favourable indications many years ago on the N. Esk, and eventually to the Fingal Valley. The infiltration of water had loosened its texture, and had given it a flaky character, and it was that appearance, together with some of the surface indications, which led some persons to suppose that it was a lignite, and not a true coal. It was, however, a true coal, and belonged to the same system as all the Southern and Eastern coal measures. There was an admixture of sulphide of iron, but not, apparently, in any objectionable quantity. The calcite present in the specimen was a point of resemblance between this and some of the Jerusalem and Fingal coal. It was not likely to prove prejudicial to the use of the coal for ordinary purposes. It seemed highly probable that the discovery would be a valuable and important one to those persons on whose property it was found. From some preliminary investigations, the proprietor had come to the conclusion that it rose in an easterly direction, and he was now driving from the lowest level that he could find in that direction, so as to strike it on a rise and eventually drain the mine by gravitation.

Mr. R. M. JOHNSTON remarked that the specimen which had been sent to him had rather a ligneous appearance. He had no hesitation, however, in saying that he believed it to be good coal, and from the presence of *Zeugophyllites elongatus, Phyllotheca, Taeniopteris* and *Sphenopteris*, identical with species in the coal measures at New Town and York Plains. There was no doubt in his mind that it belonged to the mesozoic coal measures.

The CURATOR drew attention to two fine specimens of fish that had been secured, both new to the Museum, during the month. One of these, the "Hapuku" *(Oligorus gigas)*, a fish that attains to a large size, in New Zealand many of them reaching to 150 lbs. in weight, is a deep sea fish, the present one being caught off the Hippolyte Rocks. The "Hapuku" has a peculiar interest from its close relationship to the well-known Murray Cod *(Oligorus Macquariensis)*. Dr. James Hector, M.D., F.R.S., in his "Notes on the Edible Fishes New Zealand," says in regard to the flavour of this fish: "The head and shoulders cut off this fish is most dainty food, but the flesh of the remainder is rather coarse and stringy; it is, however, well adapted for pickling, and may yet become an article of commerce." The specimen now on view to the Fellows weighed 53 lbs., and had a roe weighing about 5 lbs. The other fish was one that Mr. Morton stated he had been unable to identify with any species of Australian, Tasmanian, or New Zealand fish, in fact, he was in hopes at the next meeting he would not only be able to describe it as a new species, but to make a new genus. This specimen had during the month been washed on the bank at Bridgewater, and had been forwarded to him by Mr. T. Stanfield.

Mr. R. M. **Johnston** said, in regard to the latter fish, he felt confident Mr. Morton would be perfectly safe in making a new genus, as it was altogether unlike any genus he had observed in Gunther's valuable work on Fishes.

The **Curator** also drew attention to two skulls of Tasmanian Tigers *(Thylacinus cynocephalus)* which had been presented by the Hon. W. Gellibrand, M.L.C., one being very large, the teeth in capital condition.

### MICROSCOPE.

Mr. R. A. **Bastow** showed some beautiful mounted specimens of Tasmanian Mosses.

### VOTE OF THANKS.

Bishop **Sandford** proposed a vote of thanks to the authors of papers read at the meeting, as also to the donors to the Museum and Library.

Mr. C. T. **Belstead** seconded the motion, which was carried unanimously.

## SEPTEMBER, 1885.

The monthly meeting of the Fellows of the Royal Society of Tasmania was held at the Museum-building on Monday evening, September 7th, 1885. Mr. James Barnard, vice-president, occupied the chair, and about 40 gentlemen were present.

In the absence of the hon. secretary (Dr. Agnew) who was professionally engaged at New Norfolk, the secretarial duties were performed by the curator, Mr. Alexander Morton.

The following gentlemen, who had been previously nominated as Fellows, were ballotted for, and duly elected as Fellows of the Society, viz.:—Messrs. Chas. W. Garrard, B.A., Lond., W. Eldridge, W. Duffy, Joseph Tasman Facy.

The Curator brought forward the usual returns, viz.:—

1. Number of visitors to the Museum during the month of August:—Week days, 1,980; Sunday, 850; total, 2,830.

2. Number of visitors to Royal Society's Gardens during the month of August, 6,150.

3. Plants and seeds received at and sent from the Royal Society's Gardens during the month of August, 1885:—

From Messrs. J. Smith and Sons, Victoria—Case plants.
From the Botanical Gardens, Jamaica—Packet seeds.
From Mr. Elliot, Hobart—14 papers seeds.
From — Emmett, Esq.—Seeds Telopea truncata.
From Charles Traill, Esq.—Case plants, N.Z.
To Messrs. Vilmorin Andrieux, Paris—Package seeds.
To A. Van Geert, Belgium—Package seeds.
To Mr. Wm. Bull, London—Package seeds.
To the Royal Gardens, Kew, near London—Package seeds.
To the Botanical Gardens, Calcutta—Package seeds.
To the Botanical Gardens, Saharanpur, India—Seeds.
To the Forest Board, Madras—Package seeds.
To Messrs. J. Smith and Sons, Victoria—Plants and seeds.
To Charles Traill, Esq., Stewart Island, N.Z.—Case plants.
To the Botanical Gardens, Christchurch, N.Z.—Case plants.
To the Botanical Gardens, Melbourne—2 bags sphagnum.
To Mr. S. Purchase, Parramatta—Case plants.

Time of leafing, flowering, and fruiting of a few **standard plants in** the Royal Society's Gardens during August, 1885 :—

10th. Weeping willow commencing to break.
12th. Silver wattle commencing to flower.
14th. Common elm commencing to flower.
15th. Common snowdrop in flower.
20th. Sambucus Niger commencing to break.
20th. Common oak commencing to break.
24th. Lombardy poplar commencing to break.
25th. Horse-chestnuts commencing to break.
26th. Gooseberries commencing to break.
30th. Royal apricot commencing to flower.

### METEOROLIGICAL RETURNS.

From the Government Observer, Capt. Shortt, R.N.—Table of Observations for August.

### ADDITIONS TO THE LIBRARY DURING THE MONTH OF AUGUST.

*Agricultural Gazette*, July 6, 13, 20.

*Annals and Magazines of Natural History*, July.

*Athenæum*, June.

*Australian Scientific Magazine, The*. Vol. 1, No. 1 ; August, 1885, Victoria—From the Editor.

Birds and Mammals of Australia. By Gracius J. Broinowski.—From the Hon. W. J. Trickett, M.P., N.S.W.

Catalogue of Canadian Plants, Pt. II., "Gamopetalæ." By John Macoun, M.A.—From the Geol. and Nat. Hist. Survey, Canada.

Descriptions of the stations.—From the Meteor. Office, India.

*Gardener's Chronicle*, June 11, 18, 25.

*Geological Magazine*, July.

Goldfields of Victoria, Reports of the Mining Registrars for the quarter ended 30th June, 1885.—From the Mines Department, Victoria.

*Journal of the Society of Arts*, June 5, 12, 19, 26.

*Journal of Science*, July.

Journal and proceedings of the Royal Society of New South Wales for 1884, Vol. XVIII.—From the Society.

List of the specimens of Cetacea in the Zoological Department of the British Museum, by Henry Fowler, LL.D., London, 1885.—From the Trustees.

Micro.—Chemical Observations on the Blood, in Health and in Typhoid Fever, by Thos. S. Ralph, M.R.C.S., Victoria—From the author.

Monthly Weather Report of the Meteor. Office, London, for February, 1885.—From the Meteorological Department.

*Nature*, June.

Nineteenth Annual Report on the Colonial Museum and Laboratory, together with a list of donations and deposits during 1883-84, and the Ffteenth Annual Report on the Colonial Botanic Gardens, New Zealand, 1883-4.—From the Director.

"Open and Air Currents," by Thos. D. Smellie, Glasgow, 1885.

*Provincial Medical Journal*, vol. iv., No. 43, July, 1885, Leicester, Eng.—From the society.

Publication der Norwegischen Commission der Europaishen Gradmessung, "Geodatische Arbeiten," heft IV.—From the society.

Report of Progress, with maps, 1882 4.—From the Geol. and Nat. Hist. Survey, Canada.

Statistical Register of the Colony of Victoria for the year 1884, part II., population.—From the Government Statistician.

Udgivet af den Norske Gradmaalingskommission Vanstandsobservationer, *heft* III., Christiania, 1885 —From the society.

*Victorian* Naturalist, vol. II., No. 4, August.—From the society.

## PRESENTATION TO THE MUSEUM.

### Mammals :

Two Tasmanian Devils (Sarcophilus ursinus), Mr. Albert Flexmore.

Two Tasmanian Porcupines (Echidna setosa.) One Black Opossum (Phalangista fuliginosus.) One Grey Opossum (Phalangista vulpina), Mr. Geo. Edwards.

One Tasmanian Porcupine (Echidna setosa), Mr. A. Brent.

### Birds :

One Sacred Kingfisher (Halcyon sanctus), Mr. J. N. Short.

One Diving Petrel (Puffinuria urinatrix), Mr. Bush.

Two Mock Regent Birds (Meliphaga phrygia), The Helmeted Honey Eater (Ptilotis cassidix.) Mr. E. D. Swan.

### Fishes :

Two Apogon Guntheri, Miss Gertrude Swan.

The Sweep (Girella sp.), Mr. R. M. Johnston.

The Lamprey (Mordacia mordax), Mr. A. K. Chapman.

### Crustacea :

Shrimps (Palæmon sp.), Miss Gertrude Swan.

### Papers, etc.

A reprint of *The London Times*, containing the account of the Battle of Waterloo, London, Thursday, June 22, 1815. Mr. Geo. Richardson.

An oil painting, "The Australian Schnapper." The Hon. Wm. Crosby, M.L.C.

### PAPERS.

An interesting paper entitled, "Contributory information regarding the tin ore deposits at Mount Bischoff, Tasmania," by Baron Von Groddeck, chief mining councillor of the Hartz mining districts, and director of the Royal Prussian Academy of Mines at Clausthal, Germany, was read by the Curator, in the absence of the translator, Mr. Thureau, who had telegraphed to say that he was unavoidably detained in the country, and so was prevented from attending the meeting of the Society. In a letter from Mr. G. Thureau, F.G.S., to the Royal Society, he stated that the above paper had been published in the journal of the German Geological Society, of 1884. It was a subject he (Mr. Thureau) thought would be of great interest to the Fellows of the Society, so he had, therefore, translated Mr. Groddeck's paper. The Baron states that the Royal Academy of Mines at Clausthal was some time ago placed in possession of a very fine collection of Australian ores, the collection being presented to the Academy by Mr. M. Wajenknecht, a resident of Tasmania. Amongst the samples were found a number of specimens of tin ore, together with the rocks and the minerals said to be associated with same from Mount Bischoff. The Baron says the series particularly interested him on account of a piece of supposed quartz-porphyry, which rock, it was represented, is associated (according to the description of Mr. S. H. Wintle and Mr. Geo. H. F. Ulrich) with those tin ores, and also because of some peculiar, dense, greyish-blue coloured masses of mineral which most frequently are found to enclose those tin ores. The Baron gives a very careful analysis that he made of the specimens he had received.

Mr. C. P. SPRENT said the paper was a most interesting contribution, but it raised so many unexpected new points that it would require very careful study before the Fellows could discuss it. He would have liked to have seen some of the specimens which were sent to Germany, because since Mr. Wagenknecht visited Bischoff more information had been obtained, not only of Bischoff itself, but of the country further south. The specimens, too, ought to be considered in connection with the Meredith Range and Mount Heemskirk. He believed that some of the explanations of the German professor would throw a great deal of light on matters on which there had been great uncertainty, especially in regard to the green rock, which had always—he did not know why—been called chlorite. The professor said it owed its green colour to tourmaline. In confirmation of this tourmaline occurred at Mount Heemskirk in chlorite veins, which stuck up on the side of the mountain, being harder than the surrounding surfaces It was curious that at Mount Heemskirk this green rock was found on one side of a vein, while on the other side was quartz rock with tourmaline in it. At Mount Ramsay and the Meredith Range they also found quartz rock full of tourmaline. When the quartz porphyry decomposed it became Kaolin, owing to the large percentage of felspar it contained, a specimen of which he produced. It would be interesting to have the paper referred to Mr. Kayser and other scientific gentlemen, with a request that they should make some remarks upon it. (Applause.)

Mr. T. STEPHENS took the same view, and thought they should have further information about the specimens sent to Germany. There might have been mis'akes which, though no one was to blame for them, might have led to misconception. It would, perhaps, be well to forward specimens of rock to which Mr. Sprent supposed the author to allude to Professor Liversedge, in Sydney, for his inspection.

Mr. R. M. JOHNSTON said the observations were well worthy of attention. The specimens might not be characteristic of the country generally, though found there. The topaz rocks were found in a dyke, or wall in the mountain. He thought the typical rocks as a whole shou'd be sent to Professor Liversedge.

The CHAIRMAN said Mr. Sprent's suggestion was a valuable one, and he would, on behalf of the Council, undertake that it should be carried into effect.

2. General Observations regarding the Classification of the Upper Palæozoic and Mesozoic Rocks of Tasmania, together with a full description of all the known Tasmanian Coal Plants, including a considerable number of new species. By R. M. Johnston, F.L.S., etc., etc., illustrated by diagrams and maps which were displayed on the walls, and referred to during the reading of the paper.

Mr. Johnston, in the above paper, deals with many important questions connected with the proper classification, and the true relations of the important series of rocks in Tasmania belonging to upper palæozoic and mesozoic age, which include the upper coal measures of the midland and south-eastern parts of the island as well as the lower coal measures, which are well represented in the vicinity, Latrobe, or the Mersey. Elaborate tables were prepared by the author, showing the distribution of all the known coal plants of Tasmania, also of the fossils of the upper and lower marine beds. Sections were also prepared, showing the relations of the principal rock systems to each other ; and the question of the probable age of the greenstone mountains and tiers was very thoroughly discussed, so far as it touched upon the relation with the stratified rocks with which the greenstone masses are so intimately associated. Mr. Johnston gave illustration of greenstone rocks older than the lower marine beds of upper palæozoic age, and others again of a later date than the upper coal measures ; he is, however, inclined to the opinion that the massive greenstones of the mountains and tiers have been erupted prior to the deposit, even of the *lower* members of the carboniferous system. Mr. Johnston, in dealing *with the local* nomenclature of systems, is of opinion that the finer subdivision names of Europe will not fit the known divisions of Tasmanian rocks, and accordingly with Professor Hutton and others, would prefer local names for the sub-divisions of rocks later than the English "carboniferous." He also pointed out dangers to true classification which may arise by ignoring the facts of local stratigraphy, when dealing with imperfect fossil remains. He urges that questions of local stratigraphy should not be divorced from local palæontology, and that the association of the stratigraphy and palæontology of one hemisphere, is not always a safe guide in the determination of the actual association, in the other hemisphere of stratigraphy and palæontology.

Mr. C. H. **Grant** thanked Mr. Johnston, on behalf of the Fellows, for the very valuable paper he had read to the Society. It showed very deep research and careful reading amongst the best authorities, a large number of whom were quoted. He was pleased to see how thoroughly and philosophically Mr. Johnston treated the subject of geology, as in his earlier writings he had a far more positive manner of treating the subject. The paper would be of great value to the records, and he trusted would be only one part of the great work on geology which he understood Mr. Johnston was preparing. (Hear, hear.) It hardly admitted of discussion, but he thought they should express their satisfaction at such a valuable foundation for the study of geology in Tasmania. (Applause.)

Mr. C. P. **Sprent** referred to the application which had recently been made to the Government to put a sum of money on the estimates to assist deep sinking, and said that though that might be very desirable, the most important thing they could do was to ascertain the value of the coal deposits of the colony, especially on the extensive plain between Ben Lomond and the Western Tiers. He thought a series of bores should be put down across the plain, and that they should also have a first-class man from New South Wales who was used to the coal formations there to make an enquiry into the matter. Only within the last few days they had found coal cropping up at Longford, and very important results might follow from such action. Last year Mr. Cosmo Newbery was over here, and was speaking about the same thing, as well as of the value of their building stone, pointing out that both articles were likely to be found in the same locality, and that anyone finding a quarry of white stone in a practicable position would have a better thing than any tin mine or gold mine that had been found in Tasmania. He thought something ought to be done in the matter. He had tried to get the authorities to move in it, but they had so many important things to look after now they had not been able to give it attention. He thought the Society might use its influence in this direction. (Hear, hear.)

The **Curator** and Mr. **Stephens** also referred in complimentary terms to the paper,

The **Chairman** promised, on behalf of the Council, that the Society's influence should be used in the direction indicated by Mr. Sprent.

Mr. **Johnston** briefly returned thanks.

3. Description of two apparently new species of genus Ancillaria, by W. F. Petterd, C.M.Z.S., was read by the Curator.

### AUSTRALIA OR AUSTRALASIA.

The following paper was read by Colonel A. **Crawford** :—

There is a matter that, I conceive, certainly comes within the range of subjects of which our association takes cognisance, and to which many circumstances combine, in my humble opinion, to render its immediate and careful attention most desirable. In the hope that my views may win the approval and support of the Royal Society, I will ask you kindly to read this note at its next meeting, trusting that steps may then be taken to obviate the hazard that to me appears imminent. We are living in the expectation that at a very near date the majority of the Australian colonies—may we not hope all?—will become federated, and assume a higher position before the world in the dignity and strength that unity confers. Under what title, what cognomen, shall we claim our place among the nations of the earth? At the first glance, the query might to many appear trivial, and they would probably feel inclined to waive it as one on which they are in no way called upon to decide, whilst they might also consider it will doubtless be satisfactorily dealt with by the Federal Council at its first session. But I am sure that our Society will agree with me that every individual in these lands is or should be interested in the question of our future style and title, and that it shall be both euphonious and correct, and if I can show that a great risk does exist of our being made to appear under a designation every way inappropriate, I think the Royal Society will not hesitate to call public attention to the fact, and bring the weight of its opinion to bear upon the same. I doubt not it will have been noticed by many that in the numerous despatches and telegrams that of late have been passing between the Imperial Government and the Australian Governments relative to federation, two words constantly appear as designating this portion of the globe "Australia" and "Australasia," and they seem to be used by all parties alike as convertible terms, frequently presenting themselves in the same document as, if so used, for the purpose of avoiding tautology. A little reflection, however, will show that these terms are by no means one and the same. Their signification differs *in toto.* "Australia," whilst musical and pleasing to the ear, places at once before the mind the idea of a large and noble southern land, and therefore may be regarded as adequately representing this great portion of Her Majesty's dominions. "Australasia," on the other hand, whilst it might reasonably be applied to Burmah, Siam, Cochin-China, or even India, has in reality no true geographical significance in connection with our great island continents and its sister isles of Tasmania and New Guinea. Let it be remembered that Australia (I cling to that term) is separated from Asia and its islands by an ocean of soundings so deep as effectually to prohibit chance intercourse, and so nature has, in her own unmistakable language, proclaimed these countries by their peculiar fauna and flora to be a distinct region. Why, then, should we in any way, in name at least, allow ourselves to be looked upon as a species of dependency or excresence of Asia? Poor relations, perhaps. Whilst our real and only debt to that quarter of the world is limited probably to a few stray cocoanuts, drifted by wind and tide to our northern shores. There would be more reason exhibited in calling Africa Austral-Europe" than in denominating these colonies "Australasia," for a reference to the map will at once show that the meridians of longitude within which Australia is comprised are those that mark only the extreme eastern portion of Asia, so that, strictly speaking, Austral doesnotaccurately describe our position in respect to that continent. I will not enlarge further on these points. The little I have said will, I think, suffice to prove that "Australia" is alone the befitting title for this great division of the British realm; and, hoping that the meeting may fully concur in this opinion, I will conclude my note by begging the chairman and members to take immediate action thereon, for if anything is to be done it should be done promptly. A draft of a Federal Council Adoption Bill, prepared by the Premier of Queensland, has been received by the Cabinet, and will no doubt be speedily submitted to Parliament. Whether that bill contains any *generic term* for our federated provinces I can only conjecture, but whilst we still have the opportunity let us do what we can to insure for our united states a name to which no just exception shall hereafter be made.

Colonel Crawford added that just as the name Hobart Town was altered to Hobart, so the opportunity of federation should be taken to adopt the more euphonious name of Australia for the group.

Mr. Justin McC. Browne called attention of the Fellows to a series of interesting articles in *Notes and Queries*, which appeared a few months since on the subject of the use of the words Australia and Australasia.

Mr. R. M. Johnston said that statisticians used the term Australasia to mean the Continent of Australia, and the Islands of New Zealand and Tasmania.

Mr. E. D. Swan: And Fiji.

Mr. R. M. Johnston: When such a term was generally used, it would require very great courage to suggest any alteration. It was, however, one which would very fairly come within the scope of the dealings of the Federal Council.

Mr. J. B. Walker said they were indebted to a Frenchman President De Brosses for the term Australasia, he having conferred it in 1756. He had brought down a book "Histoire des Navigatiors aux Terres Australes,' Paris, 1756, showing the charts of that day for the inspection of the Fellows. Australia now, as he understood it, was used for the Continent, and Australasia for the larger group. He did not know whether the shorter term being more euphonious would be sufficient reason for altering it.

Colonel Crawford: But we have nothing to do with Asia at all. If you have anything call it South-eastern Asia. It makes me writhe to think of the incongruity. A Frenchman may have introduced the word, but I won't be guided by any Frenchman. (Laughter.) A century ago, too—what did he know about it? (Renewed laughter.) Let us use our own commonsense. We are famous for misnomers in this island.

The Chairman said no doubt the Colonel's remarks would elicit discussion and call attention to the subject, and so he would attain the object he had in view.

### EXHIBITS.

The Chairman drew attention to a further donation of a collection of mounted birds, received from the Trustees of the Sydney Museum. Among them was particularly noticeable two species of the handsome Racquet-tailed Kingfisher (Tanysyptera galatea, and Dana.)

The Curator drew attention to a fish he had received from Mr. D. Whitehouse. It was known as the Frost Fish of New Zealand (Lepidopus caudatus); the specimen was captured near the wharf, swimming about the surface.

Mr. R. M. Johnston drew attention to a fine specimen of a bream (Girella sp.) that he had obtained during the month; he was of opinion that the species, simplex and tricuspidata, would turn out to be identical with each other.

4. The Curator drew attention to a specimen of a kingfisher shot at Cambridge; the bird, although not included in "Gould's Handbook" or "Krefft's Fauna of Tasmania," has been occasionally shot and seen in Tasmania; it is known in Australia as the Sacred Kingfisher (*Halcyon sanctus*).

### ORNITHOLOGY.

The Curator stated that the Council of the Royal Society had received during the month a letter from the President of the Intercolonial Permanent Ornithological Committee, Vienna, which

of the Governments, and relying upon the mighty
High Protector. But such a solution is, however,
everybody, who has the progress of science at heart,
assist the committee in their assiduous exertions o
great work worthy of the working together of al
therefore confidently think to do no false step by
with the kind request to look for men in your circl
mind and intelligence of undertaking this meritorious
observing all the birds of their surrounding countries,
occurrence, trains, hatchings, and ways of life, a
observations annually (every first quarter of the
the secretary of the committee. DR. R. BLASIUS, P
Vienna.

The CHAIRMAN said that Colonel Legge, Mr. Swan
thologists, would, no doubt, give the writer the benefit
and observations, and bestow attention on the very int
raised by it. The letter would appear in the report of
and would receive the attention it deserved from the

### VOTE OF THANKS.

On the motion of Mr. C. H. GRANT, seconded by M
a vote of thanks was passed to the readers of pape
contributions to the Museum.

## OCTOBER, 1885.

The usual monthly meeting of the Royal Society o
held at the Museum on Monday evening, October 12
Barnard, Vice-President, occupied the chair, and about
present.

The following gentlemen, who had been previou

To the Botanic Gardens, Cape Town, South Africa—Collection seeds.

To the Chamber Agriculture, Washington, United States—Collection seeds.

To Messrs. Smith and Adamson, Melbourne—Seeds.

To Mr. L. Bachmer, Yokohama, Japan—Seeds.

To Miss Owen, Ireland—Collection seeds.

To the Conservator Forests, Punjaub, India—Collection seeds.

To Mrs. Oliver, New Plymouth, New Zealand—Seeds.

To C. Moore, Esq., Botanic Gardens, Sydney—Sphagnum.

To Messrs. Shepherd Co., Sydney—Case plants.

To B. F. Wellington Co., San Francisco—Seeds.

From Mr. J. Latham, Hobart—24 plants.

From Mr. S. Purchase, Parramatta, N.S.W.—Small case plants.

From Messrs. Shepherd Co., Sydney—Small case plants.

From Mrs. Archer, Hobart—Seeds.

From C. Sprent, Esq., Hobart—Seeds.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during September, 1885 :—

6th. Acacia pycnantha commencing to flower.
15th. Moutan pœony commencing to flower.
15th. Horse-chestnuts commencing to flower.
27th. Sycamore commencing to break leaf.
28th. Grape vines commencing to break leaf.
30th. Common ash commencing to break into flower.
30th. Common plane commencing to break into leaf.

### METEOROLOGICAL RETURNS.

From the Government Observer, Captain Shortt, R.N.—Table of observations for September.

### ADDITIONS TO THE LIBRARY DURING THE MONTH OF SEPTEMBER.

*Agricultural Gazette*, August 3, 10, 17, 24.

Annals and magazine of Natural History, August.

Athenæum, The July.

Bulletin of the Museum of Comparative Zoology at Harvard College, vol. XI., No. 11 ; Studies from the Newport Marine Laboratory, communicated by Alexander Agassiz, XV.; on the development of Agalma, by J. Walter Fewkes, vol. XII., No. 1 ; Chlamydoselachus anguineus, *Garm.*, a living species of Cladodont shark.—By L. Garmon.—From Alexander Agassiz.

Bulletin de la Societe Royale de Botanique de Belgique, June, 1862, 1885.—From the Society.

Catalogue of the Echinodermata in the Australian Museum, part 1, "Echini;" Desmosticha and Petalosticha.—By E. P. Ramsay, F.R.S.E.—From the author.

Catalogue des Livres de Fonds et en Nombre, Histoire, Archeologie, Ethnographie, et Lingiustique De L'Europe, De L'Asie, De L'Afrique, De L'Amerique et de L'Oceanie.—From the Society.

China and the Roman Orient, researches into their ancient and mediæval relations as represented in old Chinese records.—By F. Hirth, Ph. D.—From the author.

Chart of Java, by S. H. Lerne. From Mr. J. Wemyss Syme.

*Gardeners' Chronicle*, Aug. 1, 8.

*Geological Magazine*, Aug.

Indian Meteorological Memoirs, being occasional discussions and compilations of meteorological data, relating to India and the neighbouring countries under the direction of H. Blandford, F.R.S., vol. IV., Part 4-6. Account of the S.W. Monsoon Storms generated in the Bay of Bengal during the years 1877 to 1881.—From the Meteor. Office, India.

*Journal of Science*, August.

*Journal of the Society of Arts*, July 3, 10, 17, 24, 31.

Map showing the site of Melbourne and the position of the Huts and Buildings previous to the foundation of the Township, by Sir Richard Bourke, in 1837.—From the Government.

Maps to accompany Report of Progress, 1882-3-4.—From the Society.

Mémoires de la Société Royale des Sciences de Liège. Le tome xi., Mai, 1885.—From the Society.

Mineral Statistics of Victoria for the Year 1884, with Report of the Secretary of Mines.—From the Mines Department.

Monthly Record Meteorological Observations, April 1885, Melbourne.—From the Meteorological Department.

Monthly Notices of the Royal Astronomical Society. June.

Provincial Medical Journal, vol. IV., No. 44.—From the Editor.

Proceedings of the Royal Society of London, vols. 27—38, Nos. 232 to 237.—From the Society.

Proceedings of the Canadian Institute, Toronto, July, 1885, 3rd series, vol. 3.

Records of the Geological Survey of India, vol. 18, part III., 1885.—From the Geological Department.

Registers of Original Observations in 1885, reduced and corrected, January 18, India.—From the Department.

Statistics of the Colony of New Zealand for the year 1884, part IV., Finance, Accumulation, and Production.—From the Government.

Systematic Census of Australian Plants, with Chronologic, Literary, and Geographic Annotations.—By Baron Von Müeller. Second Annual Supplement for 1884.—From the Author.

Transactions of the Asiatic Society of Japan, vol. XII., part 4, vol. XIII., part 1, July, 1885.—From the Society.

Victorian Naturalist, Vol. XI, No. 5, September, 1885. From the Field Naturalist Club of Victoria.

Vital and Meteorological Statistics of the Registration districts of Hobart and Launceston for August, 1885. From the Government Statistician.

## PRESENTATIONS TO THE MUSEUM.

### Mammals.

Tasmanian Porcupine (Echidna setosa), Mr. Archer.

### Birds.

New Holland Goshawk (Astur novæ hollandiæ), Mr. Street.
Wedge-tailed Eagle (Aquila audax), Mr. J. N. Whitehead.
Lewins Rail (Rallus lewini), Mr. A. Flexmore.

### Fishes.

A Parrot Fish (Labrichthy mortoni), Mr. W. L. Boyes.
Blenny (Cristiceps sp.), Mr. Self.
A Young Ray, Herr Schott.
Native bread, Mylitta Australis. Mr. P. S. Seager.

### Rocks, Etc.

1. Yellow Copper Ore and Pyrites, from the Tasmanian Mine. 2. Quartz, New Native Youth Gold Mining Co., Lefroy, 800 feet level, 470 feet below sea level. 3. Outcrop of Quartz-conglomerate, Ophir Township, Beaconsfield. 4. Outcrop, "Gossan," Tasmanian Mine, Beaconsfield. 5. Sandstone, from the Lefroy Mine, Beaconsfield, 400 feet level, and 260 feet below sea level. From Mr. Joseph Davies, Beaconsfield.

### Old Documents, Etc.

Memorial Tablet of Lord Nelson, from engraved plate, demy. Miss Burgess.

Passport, granted to J. Wemyss Syme to Canton, 1885. From Mr. J. Wemyss Syme.

### Ethnology.

Two Malay creeses or daggers, used for executions, one Malay Peninsula creese, one Malay knife for cutting timber, one Malay knife for ordinary purposes, one quiver containing poisoned arrows, one Malay native dress, "sula," or native ladies' dress, one Malay head-dress, "Tappa," or native cloth used by the jungle tribes, Malay Peninsula. Volcanic dust from the late eruption, Straits of Sunda.—From Mr. J. Wemyss Syme.

"Sampitan," or blowpipe, used by the natives of the Malay Peninsula for hunting, etc. Two swords worn by Malay gentlemen.—From Mr. Brian Gaynor, of Kwaldkhangsar, State of Perak (through Mr. J. Wemyss Syme.)

In reference to the poisoned arrows,

Dr. AGNEW said there was a considerable amount of discussion as to whether they maintained their poisonous qualities, and the Curator had told him that day that he had tried an experiment on a cat with a South Sea Island arrow by introducing the tip of one of the so-called poisoned arrows under the skin, and the cat received no damage or injury from it. Some years ago the death of Commodore Goodenough was supposed to be caused by one of these poisoned arrows, but, on the whole, it was afterwards believed he died from tetanus, brought on by the season and by the nature of the wounds. A punctured wound was more apt to produce tetanus, and probably that was the cause of his death.

Dr. PERKINS said the poison used by the natives of South Africa to tip their arrows with was a fluid obtained from the bark of a tree. It acted very speedily, and some of it which had been recently analysed in Great Britain contained an alkaloid called Strephanthine which had a paralysing effect on the heart. Arrows tipped with such a fluid would kill almost instantaneously if the poison was fresh.

Mr. E. D. SWAN said the arrow by which Commodore Goodenough was killed was a very formidable weapon. These would have no such effect.

Mr. C. T. BELSTEAD: Was it an arrow or a spear?

Mr. E. D. SWAN: An arrow I believe, but the wound was a terrific one.

On examining the native ladies' dress, several members questioned if it were made on the Malay Peninsula, and

Mr. E. D. SWAN said that Wallace, in his "Malay Archipelago," said that such materials as these were sold cheaper there than in England.

Mr. J. Mc C. BROWNE related how, when at Guam, in 1850, he had seen the native women wearing such fabrics on Corpus Christi Day. Probably they were supplied from Manilla, who in turn got them from English and Scotch houses in Liverpool and Glasgow.

Mr. CHARPENTIER said one specimen was evidently block-printed. Some of the South Africans sent their native cloths to England to be printed.

Dr. AGNEW described the dresses of the native women in Ceylon as being similarly varied in hue to these specimens.

### PAPERS.

An interesting paper was read, entitled, "Shells of the Group Polycystina, illustrated by the microscope," by Mr. C. J. Atkins.—The living animalculæ of this family of microscopic shells belong to a type that ranks lowest in the scale of creation. They are Protozoa, the first or earliest form of animal life that is known to us. The floating scum of the tepid tropical ocean ceases under the microscope to be one gelatinous mass, and resolves itself into minute, but distinct globules of this rudimentary life. Though the Protozoa are unendowed with the organs that according to our ideas usually accompany animal life, we find that Providence redeems them from insignificance by the splendours of colouring that they possess, and by the variety and complex beauty of the shell framework that supports them. The Polycystinæ are classified by Dr. Carpenter (who is followed by Dr. Wallich) as Rhizopodal (*i.e.*, root-footed Protozoa). The shells are thus associated with those of the many-chambered Foraminiferæ, and mingling with that larger family they are often found, both as fossils, and in more recent deposits. The shells of the Polycystinæ, however, are composed of pure silex, and to this they owe their brilliant and ivory-like appearance under the microscope ; in this particular differing from those of the Foraminifera, which are built up of limestone(*i.e.*, carbonate of lime). The shells are further distinguished by their perforations, and by their being pronged into spines and other projections, which are frequently arranged in symmetrical devices of striking design, as in the species Haliomma Humboldtii and Podocyrtis Schomburgkii. A slide placed under the microscope this evening shows these two species from Barbadoes with black- ground illumination. Another slide shows the Haliomma separately, and mixed groupings of several other species are also on the table. Dr. Carpenter, who is always a safe guide, says of these objects :—"Few microscopic objects are more beautiful than an assemblage of the most remarkable forms of the Barbadian polycystina, especially when seen brightly illuminated upon a black ground, since their solid forms become much more apparent than they are when these objects are examined by light transmitted through them. . . . . No class of objects is more suitable than these to the binocular microscope, the stereoscopic projection of which causes them to be presented to the mind's eye in complete relief, so as to bring out with the most marvellous and beautiful effect all their delicate sculpture, reminding the observer—to compare small things with great—of the finest specimens of the hollow ivory balls carved by the Chinese."—(Dr. Carpenter : The Microscope, cap. x.) In conclusion, I cannot do better than ask you, on the recommendation of this high authority, to spend a few moments in examining the Polycystina before the close of the meeting.

Mr. R. A. Bastow read a paper on the mosses of Tasmania in continuation of former papers, illustrated by his own drawings and photographs, and by the microscope.

The following letter from Mr. A. B. Biggs, of Launceston, was read by the Honorary Secretary :—

"In my paper on our earth tremors (read 9th June last) I referred to indications of change in the general direction of the shocks, from time to time. In connection with this branch of the subject, it is interesting to note that the direction of the shock felt in Victoria on 8th inst. (as per telegram) was supposed to be from the south-west. This, so far as it may be relied on, accords approximately with the indications as per time reports, of our shock of 11th ult., which would appear to have passed through the island, beginning at Hobart (as the first noticed) and leaving at the N.E. Coast. This is almost in the reverse direction of the generality of our tremors. I have recently had the pleasure of two or three interviews with Professor Malno Milne, of Japan, who, I think, holds premier position in seismology. There was one sentence at the end of my paper of June 9, which I now regret was sacrificed for brevity's sake in printing. I there stated that, on examination, I was unable to discover any connection between our tremors and lunar positions. This deduction accords with that of Professor Milne, both as conveyed to me verbally by himself and as intimated in his latest pamphlet."

Dr. Agnew asked if any Fellow present had felt a shock of earthquake on Friday last in the forenoon.

Captain Shortt, who was referred to, said he had not felt it.

Dr. Agnew said some people in his house had felt a slight shock, but he had seen nothing about it in the newspapers.

Mr. Bernard Shaw said one of the gentlemen in his office had felt a shock on Friday morning, and had gone in and asked him if he had not felt it also.

### THE LONGFORD COAL DEPOSITS.

Mr. Brain, who is in charge of the coal mines at Longford, gave some information respecting them at the request of the Hon. Secretary. He said it was hardly fair to judge the mine yet, though, as far as he had been able to prove it up to the present time, it looked very well. The seam varied from 3ft. to 4ft. 6in. in width. It had a fine sandstone top and bottom, and the inclination or dip was from N.E. to S.W., and was very slight indeed. It would, he thought, be an excellent household coal, but not fit for steam purposes.

Dr. Perkins said perhaps Mr. Brain would be able to send them some fossils.

Mr. Brain said he had some very fine leaf impressions which he would be glad to send. He had already forwarded some to Mr. Johnston, but would be glad to make a collection for the society.

The Chairman: They will be very acceptable.

### VOTE OF THANKS.

On the motion of Dr. Agnew, seconded by Mr. Belstead, a vote of thanks was accorded by acclamation to donors of contributions and readers of papers.

After inspection of the microscopes the meeting terminated.

## NOVEMBER, 1885.

The monthly meeting of the Royal Society of Tasmania, the last of the session of 1885, was held on Monday evening, Nov. 16, at the Museum, James Barnard, Esq., V.P., in the chair. The Bishop of Tasmania, several ladies, and a large number of Fellows were present.

### Returns.

The Hon. Secretary (Hon. J. W. Agnew, M.D.) brought forward the usual returns, viz.:—

Number of visitors to the Museum during the month of October:— Week days, 1,557; Sundays, 550. Total, 2,107.

Number of visitors to Royal Society's Gardens during the month of October, 6,500.

Plants and seeds received at and sent from the Royal Society's Gardens during the month of October, 1885:—

From Mr. Wm. Bull, new plant merchant, London. Case containing 103 new chrysanthemums.

From the Botanic Gardens, Christchurch, New Zealand. Case plants, various.

From Baron Ferd. Von Mueller. Bulbs of a new crinum, and package seeds.

From the Horticultural Society, Madras. Seeds Phœnix paludosa.

To Mr. C. F. Creswell. Plants, chrysanthemums, and dahlias.

Time of leafing, flowering, and fruiting of a few standard plants in the Royal Society's Gardens during October, 1885 :—

4th. Carpinus octulus commencing to break leaf.
8th. Ailanthus glandulosus commencing to break.
14th. Tilea europœa commencing to break leaf.
14th. Morus niger commencing to break.
18th. Ulmus campestris seeds commencing to fall.
25th. Melia azederach commencing to break.

Meteorological Returns.

From the Government Observer, Captain Shortt, R.N., table of observations for October.

Additions to the Library during the month of October :—

Abhandlungen der Mathematish. Physikalischen Classe der Koniglich Bayerischen Akademie der Wissenschaften. Munchen, 1883—From the Society.

Almanach der Koeniglich Bayerischen, 1884.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the Operations, Expenditures, and Condition of the Institution for the Year 1882.—From the Institution.

Annual Report of the Chief Signal Officer U.S. Army to the Secretary of War, for the fiscal Year ending June 30th, 1882, Parts I. and II.—From the Department.

Do. do. for 1883.

Annual Report of the Department of Mines, New South Wales, for the year 1884.—From the Mines Department.

Anales de la Oficina Meteorologica Argentine. Tome IV. By B. A. Gould.—From the Department.

Annals and Magazine of Natural History, London, September, 1885.

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### PRESENTATIONS TO THE MUSEUM.

#### Mammals :

Tasmanian Porcupine (Echidna setosa), Master E. Hull.

Tasmanian Porcupine (Echidna setosa), Mr. C. H. Lindley.

Tasmanian Porcupine (Echidna setosa), Mr. Lovett.

Tasmanian Rat Kangaroo (Hypsyrymnus apicalis), Mr. J. Bradshaw.

Two Opossum Mice (Dormicia gliriformis), Mr. W. H. Cole.

#### Birds :

Australian Bittern (Botaurus australis), Mr. Perkins.

Australian Goshawk (Astur approximans), Mr. W. Peacock.

Collared Sparrow-hawk (Accipiter torquatus), Mr. Flexmore.

Summer Bird (Graucalus parvirostris), Mr. Geo. Hinsby.

Magnificent Rifle Bird (Ptilorhis alberti), adult male, young male and female. Queen Victoria's Rifle Bird (Ptilorhis victoriæ), male and female. Rifle Bird (Ptilorhis pardiseus), male and female, the Trustees Brisbane Museum.

#### Birds' Eggs :

A Collection of American Birds' Eggs, Mr. Geo. Hinsby.

#### Fishes :

Velvet Fish (Holoxenus cutaneus), Mr. Bissett.

Young English Salmon (Salmo salar); young California Trout (Salmo fontinalis), the Salmon Commissioners.

Parascyllium variolatum, Mr. J. J. McCluskey.

#### Reptiles :

Lizard (Grammatophora sp.), Mr. E. D. Swan.

Three do. (Grammatophora sp.), Mr. C. H. Lindley.

One do. (Hinulia whitei), Mr. E. B. Gawne.

October meeting, he would wish to infer from the
11th the centre was nearer Hobart than the
mania. After comparing the time of the shock, as
observers in Tasmania, the speaker found that F
station that would give him the grounds for the s
centre is not at some place in a line north or sc
He (Capt. Shortt) consistently considered it to
miles to the eastward of the North-East Co
sometimes farther north of it, which has be
the last year, the shocks having reached G
than Tasmania; and the time of those noted ther
upon as more reliable than at country
Victoria or Tasmania. Mr. Biggs speaks o
perienced in Victoria on September 8 as com
the North-Eastern districts. It would be reaso
places on the Southern Coast of Victoria ought
greater severity. In the monthly record of shocks
direction is always given as from south to no
is nearly north of the slope where the sea bott
to a depth of over 2,000 fathoms, which the s
should attribute to the region of the great phys
and the origin of the disturbance. Obse
easily deceived in the direction of shocks, as
have been received at the observatory from the isla
also in Tasmania, as proceeding from N. to S., N
West to East, and *vice versa*; Mr. Biggs has
account of a shock as recorded by a seismomet
N.W., so it is easily seen how difficult it is t
(more especially by an observer feeling the earlier
what direction they really proceed; in fact, from Goo
always given the direction as from N.W. to S.E., whe
reverse. In his letter Mr. Biggs acknowledges P
Japan, holds a premier position in seismology. Tha
sequent to his late visit to Tasmania and after obt
information as to earthquakes felt both in Victo
has written an article on the earth movements in

material became valuable industries in other countries. The paper led to an interesting discussion in which various members took part, particular mention being made of the destructive nature of the tar thus allowed to run to waste in destroying or tainting many of the fish in the wells of the fishermen's boats.

A paper by Mr. J. R. McClymont, M.A., Edin., entitled "Australian Topography: Edel's Land, De Witt's Land, and Carpentaria," was read by Mr. J. B. Walker. Mr. McClymont attempted to prove by references to Tasman's Letter of Instructions, 1644, and to early maps that the Land of Edel, on the west coast of Australia, was discovered in 1617, two years earlier than the date usually assigned to the discovery, and that1619 is only the date of a second visit. The paper also showed that the name Carpentaria is not met with before 1663, although a river emptying into the gulf received the name of the president of the Dutch East India Co. in Tasman's map of 1644, and possibly at a still earlier period. In concluding his notes, Mr. McClymont expressed his thanks to Mr. Justin Browne and Mr. J. B. Walker for the loan of books but stated as his opinion that "private collections can never supply the place of a public collection of works relating to Australian discovery. That if Australians are to become familiar with the beginnings of Australian history, the means of studying the sources whence that history is drawn must be placed within their reach—an end to be attained by the gradual and persistent acquisition in each colony of the books, maps, and manuscripts bearing on its own history, until an Australian library shall be established, rich in all procurable rarities of colonial history and discovery."

The Chairman said that a great many years ago a collection was made of old historical books which were put into the Franklin Museum, and were subsequently handed over to trustees for the benefit of the then projected college. He thought that it would not be out of place for the society to enter into negotiations with the representatives of those trustees with the view of getting them deposited in the Society's Library.

Mr. J. B. Walker said that the books referred to were now in Christ's College Library, and stored in one of the rooms of the Town Hall, under the care of the Warden of the College.

Mr. Justin Browne exhibited a copy of Tasman's map showing Tasmania and Australia as one large island, which was examined with much interest.

Bishop Sandford moved,—"That it be remitted to the council of the Royal Society to consider during the recess that steps should be taken to further the collection and preservation of records, books, documents, maps, etc., which may serve to illustrate the history of the colony in all its particulars, and to throw light on all that concerns the discovery, geography, and development of the colony, and to report to an early meeting of the society at its next session."

Mr. J. B. Walker seconded, and the motion was unanimously passed.

Mr. T. Stephens, M.A., read a paper, entitled 'Notes on boring operations in search of coal in Tasmania, 1884" (continued).

In course of a short discussion that followed,

Mr. C. H. Grant said that so recently as Saturday last he visited the coal district at Fingal, when it was brought under his notice that the coal at Mount Durham, situated at a distance of 2½ miles, seemed to be a continuation of the 8ft. seam now well exposed at Mount Nicholas. The value of the coal in that district seemed to be inconceivable, and he had no doubt that it would rival some of the coalfields of the Old World.

that, at no distant day, every person of education within the range of the society will seek to be i of Fellows. The attendance at the evening meetin increased, and a deeper interest has been manifested more especially when, by the kindness of various n the microscope has been so freely given in the illu The presentations to the Museum have been num comprising specimens in almost every department c and there has also been, as usual, a large number miscellaneous description. The contributions to the many and valuable, in addition to the various st subscribed for by the Society; and there has been l London a case of rare and choice volumes of a strictly chiefly relating to ichthyology, being the first ins been purchased by means of the interest derived from Memorial Fund. These books have been placed o spection. A catalogue of the extensive collection of b in the library has been prepared by the librarian t necessity. Mr. Morton has deservedly received the of the Fellows for the admirable manner in which formed. With regard to the papers read at the ev may, I think, be affirmed that the work of this sessio able comparison with that of any which have pr respect to the number and variety of the subjects b well as to their scientific value and importance. I comprehensive sketch of the "Zoology of Australia, naturalist, our recently elected honorary member, Macleay, F.L.S., of Sydney, written for publicatio which that gentleman consented, at the request of ou Baron Von Mueller, should first appear in its origin Transactions before its translation into a foreign lang contributions by Mr. R. M. Johnston, F.L.S.,—(1 fossils of the Gordon limestone; (2) on new species of the tertiary deposits of Mount Bischoff and elsewher classification of the upper palæozoic and mesozoic ro together with its coal plants, will be especially appreci practical importance, the thoughtful consideration of the community, from its bearing and influence on the public health. Much gratification, again, has been afforded by the interesting account of the mosses of Tasmania by our zealous co-worker, Mr. R. A. Bastow, a study which he has succeeded, aided by the microscope, in rendering both attractive and fascinating. Notes on different branches of science have also been read by Mr. W. Saville-Kent, F.L.S., F.Z.S., and by Mr. C. J. Atkins, and rendered, in both cases, of increased interest by means of the microscope. In selecting the foregoing for special mention, it is with no desire to under-rate the merits of the other excellent papers that have been read before the Royal Society, and which will be contained in our forthcoming volume of Papers and Proceedings. This retrospect would be incomplete were I not to mention that the present year will be memorable for the receipt of a handsome legacy of money and land, bequeathed to the Royal Society by the late Joseph Milligan, F.L.S., formerly one of its warmest supporters. This bequest has already been placed on record in the proceedings, and a portrait of the generous benefactor has been framed and placed in the library of the Society. I digress here to acknowledge our debt of gratitude to *The Mercury* for its liberality in devoting so much space in reporting the proceedings of the Society, and presenting so promptly, at next morning's breakfast table such a full and accurate epitome of the previous evening's meeting. (Applause.) Fellows are aware that an important fundamental change has taken place in the constitution of the Royal Society, by the withdrawal of the Museum and Gardens from its sole control, and establishing them as two separate public institutions under the management of certain official trustees, together with six others elected from the Council of the Royal Society. No doubt this has involved a surrender of private rights to some extent, and one which did not at first sight commend itself to all the Fellows, especially to those who, like myself, had been associated with the Royal Society from its inception. Any scruples, however, which had been called forth when the change was first proposed, soon yielded to the manifest solid advantages which must accrue to the people of Tasmania by placing those institutions on a permanent and national basis. (Hear, hear.) As an example, it is fair to expect that more ample funds in their support will be available than has hitherto been the case; for Parliament, while not feeling justified, perhaps, in voting more than the barest sums in subsidising a private, or at most a quasi-public society, must realise the obligation of adequately providing for the efficient working of these in common with other public establishments. Accordingly, additional means are already provided in the Act for the support and growth of the Museum; but, more important still, the sum of £3,000 has been voted for the erection of another wing to the Museum, urgently required to secure more ample accommodation for the rapidly increasing number of presentations. The Botanical gardens will also be rendered more attractive in future by the superintendent being less stinted as regards the supply of labour and appliances. Occasion has also been taken to give space for an art gallery for the reception of pictures and works of art, which will be at once recognised as calculated to diffuse a highly salutary influence upon public taste. But this is not all. It is designed, besides, to connect with this building a laboratory for the Government Analyst, which will enable analyses of mineral specimens and samples presented to the Museum to be made, as it were, on the spot. Accommodation in a hall for the delivery of courses of lectures on scientific subjects is also contemplated, and must prove of great public utility. In conclusion, I would simply remark that encouragement for the future may be fairly deduced from the success of the past; and that, with united action together with individual effort on the part of Fellows, good hopes may be entertained that the Royal Society will continue its long and prosperous career with undimmed lustre. (Applause).

Bishop SANDFORD moved,—"That the members record their warmest thanks to the vice-president for the address which he had just delivered." He was very much afraid that they were trespassing a good deal on his consideration and kindness in regard to the change which had been carried on in connection with the Museum and Botanical Gardens, because they knew that those so long and so much interested in the society as the chairman had come to regard with dislike anything like a radical change in its constitution or management. Mr. Barnard, however, had shown that he could rise superior to such considerations, and had expressed warm appreciation of the advantages to be derived from the change. He proposed that they thank the chairman most cordially for the spirit and tone of his address ; also that thanks be accorded to those who had read papers that night, and those who had forwarded presentations and donations.

Mr. C. J. ATKINS seconded, and the motion was passed.

The CHAIRMAN having acknowledged the compliment, the meeting separated.

## LIST OF PRESENTATIONS TO THE MUSUEM FOR THE MONTHS OF NOVEMBER AND DECEMBER.

### Mammals :

A Tasmanian Tiger, Thylacinus cynocephalus, the Hon. W. Gellibrand.
A Tasmanian Rat, Mr. Turvey.
Gunns. Bandicoot, Perameles Gunni, a Bat, Mr. Archer.

### Birds.

A Gala Parrot, Mr. Bedelph.
White Fronted Falcon, Falco lunulatus, Mr. Massy,
Eagle Hawk, Aqiula Audax.
Australian Goshawk, Astur novæ hollandiæ, Mr. O. Flexmore.

### Fishes.

A Saw Fish, Pristes cp., Mr. Johnston.
Dog Fish, Scyllium laticeps, Mr.
Elephant Fish, Callorhynchus antarcticus, Mr. G. Bridge.

### Attendance at the Museum.

November, Week Days 1540. Sundays, 550.
December, „ „ 1557. „ 580.
Gardens, November, 6500; December, 6200

# ZOOLOGY OF AUSTRALIA:

BY THE

## HON. W. MACLEAY, M.L.C.

[Read April 14, 1885.]

The Fauna of Australia is, taking the Animal Kingdom as a whole, extremely rich and varied; it is also more distinctively local in its general character than that of any other large area of the earth's surface. But, though the strictly Australian character exists throughout, the Fauna varies considerably in different parts of the country, the variations being evidently caused in some instances by differences in soil and climate, and in others by contiguity to other Zoological regions.

Those which are produced by soil and climate alone,—such, for instance, as the marked difference in the Fauna of the East Coast Districts and the huge basin of the interior west of the Coast range,—are evidently mere changes in the indigenous Fauna, brought about by the instrumentality of these causes exercised over an immense period of time; while the still more marked distinctions between the Zoological productions of the southern and temperate regions of Australia and the tropical northern parts, though, no doubt, also much influenced by climate, may also be traced to the vicinity of the Indo-Malayan islands and seas, from which, undoubtedly, many of the North Australian Birds, Butterflies, Fishes, &c. have been derived. Wallace, in his great work on "The Geographical Distribution of Animals," divides his Australian Region into—1, The Austro-Malayan; 2, The Australian; 3, The Polynesian; and 4, The New Zealand Sub-regions.

It is to the second of these only, the Australian—the Islands of New Holland and Tasmania—that the following observations will apply. But of the Zoology even of this limited portion of the whole region there is yet much to be learnt. Large portions of the north-west and centre of Australia are still a *terra incognita*, and even in the best known districts the smaller forms of Animal life have been but little investigated.

To begin with the Sub-kingdom *VERTEBRATA*. The Class first in rank and importance is the **Mammalian**, and in this Australia occupies certainly the most unique position in the universe. The absence of most of the Orders of this Class common in other parts of the world, and the prevailing presence of Orders almost unknown except in Australia, are the most remarkable features of the Mammalian Fauna in Australia. The paucity of numbers is also a striking feature, the entire number of known species not exceeding 160 of all Orders.

The BIMANA are represented by a variety or species of the genus *Homo*, supposed to have migrated from countries north of Australia at some remote period. The Australian Blackfellow, as he is called, is believed to belong to the division of the human race known as the "Oceanic Negro," and though he does not present much resemblance to the Papuan, there can be little doubt but that both races emanate from the same source or centre.

The Order QUADRUMANA is entirely absent from Australia. The FERÆ are also unrepresented, with the exception of the Native Dog *(Canis dingo)*, which in all probability is only coeval with man as an inhabitant of Australia. The PINNIPEDIA are represented by a few species of Seals, common to other parts of the Pacific as well as the Australian Coasts.

The CETACEA are mostly of wide range, and can scarcely be said to belong to any country; but the seas round Australia abound in whales of several species, and the shores swarm with porpoises. One genus, however, is peculiar to the warm seas of Northern Australia,—a species of Manatee *(Halicore Dugong)*, an animal much valued for the medicinal qualities of the oil which it yields.

The important Order UNGULATA is entirely absent from Australia. There is not even a Native Pig, though two species are found on the adjacent island of New Guinea. Since the advent of the white man all, or nearly all, of the most useful animals of this Order have been successfully acclimatized. The Orders PROBOSCIDEA, EDENTATA, and INSECTIVORA are also totally unrepresented. The CHIROPTERA number about 30 species; of these five belong to the PTEROPODIDÆ or Frugiverous Bats, generally called Flying Foxes, and they are all probably importations from New Guinea and the islands of the Dutch Archipelago. The Insectivorous Bats are chiefly of the genera *Harpyia*, *Mollossus*, *Taphozous*, *Rhinolophus*, *Nyctophilus*, *Scotophilus*, *Vespertilio*, and *Nycticejus*.

The great Order of RODENTIA is limited in Australia to about 27 species of the Family MURIDÆ, and these are distributed thus:—15 species are placed in the genus *Mus*, nine in the genus *Hapalotis*, a genus only differing from *Mus* in the large ears and elongated tail, and three or four species of the genus *Hydromys*, the Beaver Rats of Australia and Tasmania.

But it is in the remaining two Orders of the Mammalia that Australia shows the greatest dissimilarity to the rest of the world.

The MONOTREMATA and MARSUPIALIA, the two Orders in question, comprise all the Implacental Mammalia known. The first of these, the MONOTREMATA, consists of two genera only—*Echidna* and *Ornithorhynchus*—the first (*Echidna*), containing three species—one found in New Guinea; and the other (*Ornithorhynchus*) of one species, exclusively Australian. The embryology and true position of these animals have long been a puzzle to naturalists; but investigations lately made by Mr. Caldwell, Fellow of Caius College, Cambridge, are likely to set all doubts at rest for ever. The results of his labours have not yet been published, but it is known that he has ascertained beyond question that both genera are oviparous. Dr. Miklouho Macleay has also lately been making observations on the temperature of the body of living Monotremata, and has found it to be extremely low for the class of animals to which they seem to belong, the temperature of the Echnida being not over 85° Fahrenheit, and that of Ornithorhynchus about 10° less, or 75° Fahrenheit.

The MARSUPIALIA form the main mass of the Australian Mammalia, an Order unknown elsewhere among recent animals, except in the case of the DIDELPHIDÆ (Opossums) of North America. This Order, to judge from the Fossil remains, had a wide and comprehensive range over the surface of the earth during the period known to geologists as the Jurassic, and the inference therefrom is that while other portions of the globe have been submerged since that period, and re-inhabited by a later growth of living things, Australia, or the greater part of it, has remained unchanged, except to the extent produced by extensive denudation and deep alluvial or glacial deposits during countless ages. Geological discovery bears out this hypothesis, inasmuch as it has demonstrated the existence, in the filled-up cavities of the Silurian Limestone Rocks and the deep Pleistocene deposits found throughout Australia, numerous bones of Mammals of extinct species, and some of gigantic size, but all Marsupial.

The existing Marsupials of Australia number a little over 100 species, and these may be very naturally divided into five groups, which very faintly represent, or are supposed to represent, some of the missing Orders of the Placental Mammals. Thus the grass-eating Kangaroos are said to represent the UNGULATA; the Leaf-eaters—Opossums, Flying Squirrels, &c.—the RODENTS; the Entomaphaga, the INSECTIVORA; and the Sarcophaga, the FERÆ. However, these are only relations of analogy—there is no real affinity. The first of these groups,

Flying Squirrel tribe, about six species, (
*Belideus*, and *Acrobata*. The Leaf-eat
very peculiar Sloth-like form of the *A*
Bear.

The Sarcophaga, or Carnivorous Mar
be limited to the *Dasyurus* or Native
species of *Thylacinus* or Tiger of Tas
Australia, and the *Sarcophilus* or Tasm
are also a number of smaller Carnivoro
out Australia which can scarcely be class
ferocious animals: these are *Chætocerc*
*gale*, two species; *Antechinus*, about eig
six species, chiefly inhabitants of trees;
genera, *Antechinomus*, and the very remar
Anteater, *Myrmecobius*.

One very anomalous Australian Mar
mentioned—"The Wombat." There ar
to exist at the present day; they are r
rather large size, burrow deep in the grou
in their habits; the abundant fossil rema
allied genus, lead to the belief that the
more numerous and larger than they are
in the Marsupial Family of RHIZOPHAGA
*colomys*.

## Class Aves.

The Birds of

one-sixteenth of the total number of known birds, estimated at 12,000 species.

The ACCIPITRES of Australia number about 40 species out of a total of 600, chiefly of the Family Falcondidæ. The STRIGIDÆ are not numerous, and the VULTURIDÆ are not represented at all. The most noticeable species in this Order are of the sub-genera *Gypoictimia* and *Lophoctinia*.

The Order VOLITORES, or the FISSIROSTRES, is well represented in some of its families; thus, the CAPRIMULGIDÆ number nearly 20 species, chiefly of the Australian genus *Podargus*, and the ALCEDINIDÆ about 15 species, those of the genus *Dacelo*—generally known as "Laughing Jackasses," from their peculiar cry—being of large size and peculiar to the Australian region. There are five species only of the HIRUNDINIDÆ, and one of the CYPSELIDÆ. A species of *Eurystomus* and a *Merops* are also found in the country, both summer visitants from New Guinea. The families CAPITONIDÆ, BUCEROTIDÆ, TROGONIDÆ, TROCHILIDÆ, &c. are entirely unknown.

The Order PICI is also unknown in Australia. The SCANSORES are represented by the CUCULIDÆ, of which Family there are 15 species, and some of the genera, such as *Scythrops*, *Eudynamys* and *Centropus*, are confined to the Australian region. The Order PSITTACI is distinguished for the variety and beauty of the Australian species. They number 70 out of a total of 560 species, or one-eighth of those of the whole world. Among the Cockatoos the genus *Calyptorhynchus*, or the Black Cockatoos, are the most characteristic forms. Among the Parrots the most populous genera are *Platycercus*, *Psephotus*, and *Euphemia*.

The Order PASSERES occupy in Australia, as in all the rest of the world, the most important position as regards numbers. Many families of them, familiar objects in other parts of the world, are here wanting, and those which are represented here are for the most part of distinct genera.

The NECTARINIDÆ count only 1 *Dicæum* and 1 *Cinnyris*. The MELIPHAGIDÆ, on the contrary, are a Family peculiar to Australia, seeming to occupy the position of the Trochilidæ in America and the Nectarinidæ of Asia. They are very numerous, consisting of 19 genera and nearly 200 species. The genus *Ptilotis* is the most numerous and most typical of the group.

The CERTHIDÆ and SITTIDÆ are represented by a few species of *Climacteris*, *Orthonyx*, and *Sittella*. The PITTIDÆ consist of one genus only, *Pitta*; four species are Australian, the others belong to the tropical regions north of Australia. Under the Family of ORIOLIDÆ may be classed a number of truly Australian Genera, including the singular Bower Bird, several special species, the Regent Bird, and *Oreocincla* and *Cinclosoma*.

Among the large Family of AMPELIDÆ there is but one Australian genus, *Pardalotus*, but it constitutes a peculiar Australian group. In the family DICRURIDÆ the genus *Artamus* furnishes eight species, and is almost entirely Australian.

The LANIIDÆ, CAMPHEPHAGIDÆ, and MUSCICAPIDÆ are rich in species of the genera *Graucalus*, *Camphephaga*, *Pachycephala*, *Colluricincla*, *Falcunculus*, *Manucodia*, *Rhipidura*, *Seisura*, *Myiagra*, *Micrœca*, *Monarcha*, *Gerygone*, *Smicornis*, *Petroica*, *Melanodryas*, *Pœcilodryas*, *Drymodes*, *Eopsoltria*, and *Menura*, the last the most remarkable of all Australian genera. The weaker forms of the DENTIROSTRES, which may be included in the Family SYLVIIDÆ, are also numerous, and the genera are almost entirely Australian; they include the genus *Malurus*, *Cisticola*, *Acanthia*, *Geobasilea*, *Ephthianura*, &c. Of the ALAUDIDÆ there are only two species known; of the STURNIDÆ one only. The FRINGILLIDÆ, the most numerous Family in other parts of the world, are almost unknown; the few species there are belong to the *Ploceidæ* section and to the genera *Estrelda*, *Munia*, *Donacola*, *Emblema*, *Pœphila*. Of the CORVIDÆ there are but four species, and these are of mostly strictly Australian genera. The lovely Family of the PARADISIDÆ does not, except in the instances of the three species of *Ptilorhis* (the Rifle Birds) reach so far south as Australia.

The Order COLUMBÆ is rather richly represented as to numbers, and remarkably so as to beauty of plumage. In the north or tropical parts, the Polynesian group comprised in the genus *Ptilopis* is represented by four species; a few large fruit pigeons of varying genera are also found abundantly in Northern Queensland, while the more temperate parts of Australia possess a number of species of Ground Pigeons of the genera *Phaps*, *Geophaps*, *Lophophaps*, *Ocyphaps*, *Geophelia*, &c.

In the next Order, the GALLINÆ, Australia shows a greater departure from the rest of the world than in any other Order of the Aves. There is really nothing in common with any other country, except the possession of a few species of Quails, and these mostly are only occasional birds of passage, and come probably from Central Asia. The PTEROCLIDÆ, the TETRAONIDÆ, with the exception just mentioned, the PHASIANIDÆ, and all the well known GALLINÆ of other countries are entirely absent, and the Order is represented by a family of extraordinary appearance—the *Megapodidæ*, or Mound-builders. This family comprises three genera—*Leipoa*—one species inhabiting the arid wastes of the interior; *Talegalla*—one species confined to the East Coast, as far south as New South Wales; and *Megapodius*—two species, limited to the extreme north. Of this last genus, species have been found on many of the islands of the North Australian Coast and Polynesia.

The Order GRALLÆ, or Waders, numbers about 80 species, but they do not differ so much from those of the rest of the world as in the preceding Orders. The most noticeable genera are *Esacus*, *Porphyrio*, and *Tribonyx*.

The ANSERES, or Natatores, number about 150 species in Australia, but present few local or distinctive characters. The ANATIDÆ are represented by one Swan (a black one), and about 20 species of Ducks. The genus *Cereopsis* is Australian, and so is *Anseranas*. *Biziura* is also a remarkable form. The Gannets, Cormorants, Darter, and Pelican are, with the exception perhaps of the last, the same the wide world over. The Frigate and the Tropic Bird are found in the warm seas of the north. The *Procellaridæ* are numerous at sea, the *Laridæ* and *Sternidæ* on the shore. Divers and Grebes are numerous, and in the extreme south the Penguins make their appearance. Indeed it may be said that all the Ocean Birds, from the ALCIDÆ of the Antarctic Regions to the PHŒTODONLIDÆ of the Tropics, are to be found within the circuit of the Australian Seas.

The STRUTHIONES form an Order of which there are few living species; and of the five known living genera—*Struthio*, *Rhea*, *Dromaius*, *Casuarius*, and *Apteryx*—two are exclusively of the Australian Region. The genus *Dromaius* (the Emu) consists of two species, one of Eastern and one of Western Australia. The other genus, *Casuarius* (the Cassowary), comprising one Australian species, is also found in New Guinea and New Caledonia.

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In the Third Class of the Vertebrata, the **Reptilia**, Australia sustains in a marked manner its distinctive character. The CHELONIA are, with the exception of the marine TESTUDINÆ, or Turtles, which are common to all the seas of the Tropical Ocean, of strictly Australian species, and are found in every river in the country; and though not so numerous in species as the Order appears to be in America, yet when well known they will be found to be much more numerous than is at present supposed. Eight species only are recorded in Krefft's "List of Australian Vertebrata," published several years ago, belonging to the genera *Chelodina*, *Chlamys*, *Elseya*, all solely Australian.

The CROCODILIA are limited in Australia to two species, so far as at present known. One of them, *Crocodilus porosus*, is common about the mouths of all the rivers of Australia within the line of the tropic, and indeed sometimes south of it. The other, *Tomistonia Krefftii*, a Gavial, has not been seen except in rivers in the vicinity of Rockingham Bay.

Snakes of Australia at 58,
excess of those of India and America.

These are all Colubrine Snakes, of the Fa with the exception of one genus, *Acanthophis* one species, known as the "Death Adder"), wl affinity to the VIPERIDÆ. The genera of Snakes (almost exclusively Australian) are *I donaja*, *Pseudechis*, *Brachysoma*, *Furina*, *R hyurophis*, *Petrodymon*, *Cacophis*, *Vermicella*, *Hoplocephalus*, and *Tropidechis*.

There are 7 species of the TYPHLOPIDÆ species of the BOIDÆ, of the genera *Morelia*, *Li* and *Nardoa*.

The COLUBRIDÆ are far from numerous. the genus *Coronella* has been described, one of *H* of *Zamenophis*, and two of *Tropidonotus*. Sev DENDROPHIS are found in the tropical forests one species only extends into the temperate r South Wales.

Three species of the DIPSADIDÆ have bee extreme north-west of the country has supplied of the genera *Cerberus*, *Myron*, and *Fordonia*, HOMALOPSIDÆ. The CROTALIDÆ are entire Australia, and the VIPERIDÆ are represented by the "Death Adder," mentioned previously.

The SAURIA, or Lizards, are also numer number of species of the Order in the world 900, and of these about 150 are Australian, the whole. The families AMPHISBÆNIDÆ, CH

*Omolepida*, *Siaphos*, *Rhodona*, *Soridia*, *Trachydosaurus*, *Cyclodus*, *Silubosaurus*, *Egernia*, *Tropidoleipsma*.

The NYCTISAURA are also fairly numerous, and are represented by the genera *Ardura*, *Straphura*, *Diplodactylus*, *Peripia*, *Gehyra*, *Goniodactylus*, and the very peculiar and strictly Australian genus *Phyllurus*.

The tribe of the STROBILOSAURA is confined in Australia to the family AGAMIDÆ, and to the genera *Tiaris*, *Chelosauria*, *Gindalia*, *Physignathus*, *Chlamydosaurus*, *Lophognathus*, *Diporophora*, *Grammatophora* (many species), and the very remarkable genus, *Moloch*.

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The Class **Amphibia** is limited in Australia to the one Order, the BATRACHIA SALIENTIA, or Tailless Amphibia. The *Cœcilidæ* and the *Urodela* are unknown. The number of described species is about 50, and nearly half of these belong to the family of *Hylidæ*, or Tree Frogs, and none of the genera of that family are peculiar to the country.

The RANIDÆ, on the other hand, exhibit a decidedly local character; the genera *Myzophyes*, *Lymnodynastes*, *Cryptolis*, *Crinia*, *Hyperolia*, *Cheiroleptis*, *Heleioporous*, *Pseudophryne*, *Notadon*, and *Myobatrachus* being strictly Australian.

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The Fifth Class of the Vertebrata, the **Pisces**, are very numerous in Australia. They were catalogued by the Hon. W. Macleay, F.L.S., at 1291 species in 1883, and as over 100 species have since been described by Chas. de Vis, Director of the Queensland Museum, they may now be estimated at 1400, or one-seventh of the total number of species of fish on the globe, which may be roughly taken at 10,000. There is, as might be expected from the limitless nature of the element they inhabit, less speciality among the Fishes than among the Land Animals; but still there is sufficient to give an easily recognisable character to the Australian Fauna. The Fresh-water Fishes, though not numerous, are solely, or almost solely, of genera unknown elsewhere. The Fishes of the Sea Coast are to a much less degree distinct from those of other places, while the Ocean, or Deep-sea Fishes, seem to differ very little from those of the rest of the world.

There are among this Class also, as with the Birds, wide differences in the Fauna in different parts of Australia, arising from climate, temperature, currents, and other causes; thus the Fishes of the Victorian, South Australian, and Tasmanian Coasts are almost entirely different from those of the warm regions of the north, where the Polynesian type predominates; mixed towards the north-west with Indo-Malayan forms; while the coast of New South Wales, with its warm current, forms the meeting-ground of the Fishes of both zones. The Fishes of the West Coast are but little known.

There are about 200 species of Percoid Fishes in Australia. Of the group PERCINA, there are a few species of *Lates*, which are the best fishes of the East Coast and Victorian rivers of strictly Australian genera—*Microperca* and *Enoplosus*. The SERRANINA or Rock Cod groups are numerous, the genus *Serranus* generally occupying the warmer seas, and *Plectropoma* the temperate; *Mesoprion* is also numerously represented. There are several other genera, but the most distinctive are *Myriodon* and *Glaucosoma*. There are two species of *Priacanthus* in Australian waters. The *Apogonina* are small fishes, and present no forms of a marked local character. The genus *Ambassis* is found in the north, but in other parts its place seems to be occupied by *Pseudo-ambassis*, a genus only found in Australia; *Edelia*, *Acanthoperca*, and *Mannoperca* are also Australian genera belonging to this group. Some species of the genera *Apogon* and *Apogonichthys* are inhabitants of fresh water, and Castelnau's genus *Gulliveria* is entirely a river fish. The group GRYSTINA consists, with a few exceptions, of freshwater fishes, mostly of considerable size and great value. The chief exception to this rule is the genus *Arripis*, of which there are two species; the one best known, *Arripis salar*, the Salmon of the Colonies, is a handsome fish of large size, which frequently appears on the coast of New South Wales and Victoria in large shoals, and is most destructive to other fish; it is of little value for food, and in form and habit resembles more one of the raptorial *Scombridæ* than a true perch. The Freshwater genera of this group are *Oligorus*, the genus of the far-famed "Murray Cod," of which some species are found in rivers on the Eastern Coast, and also in salt water. *Ctenolates*, several species, fine fish inhabiting the Murray system of rivers; *Murrayia*, the same; *Riverina*, the same; *Dules*, northern rivers; and *Therapon*, many species inhabiting all rivers, and some species Marine Fishes.

The group PRISTIPOMINA contains a number of species of the genera *Pristipoma*, *Dagrammo*, *Gerres*, *Scolopsis*, *Dentex*, *Aphareus*, &c.; only two genera seem remarkable—*Hyperoglyphe* and *Histiophorus*: the latter contains two species, large fishes, and apparently very rare.

The SQUAMIPINNES are rare in the temperate parts of the Australian seas; but in the tropical regions the genera *Chætodon*, *Heniochus*, *Holacanthus*, and *Chelmo* become abundant. The genera *Scorpis* and *Atypus* placed in this family are almost exclusively Australian forms. The NANDIDÆ are only represented by a very few species of *Plesiops* and *Trachinops*, Australian forms, to which may be added the genus *Ruppellia* of Castelnau. The true NANDIDÆ (freshwater fishes), are unknown. The MULLIDÆ number about 12 species of the genera *Upeneus*, *Upeioides*, and *Mulloides*; they are most abundant in the warm seas.

The SPARIDÆ are numerous. The section of these which are vegetable feeders and have incisor teeth is largely represented by the genera *Girella* (Blackfish), *Pachymetopon*, *Tephræops*, and *Haplodactylus*; those with molar teeth embrace some of the most valuable food fishes of the country, including species of *Pagrus* (the Schnapper), *Chrysophrys* (the Black Bream), *Lethrinus*, and *Sphærodon*. The *Cirrhitidæ*, also very valuable as food fishes, are represented by genera entirely, or almost entirely, Australian; these are *Latris* (the Trumpeters), *Chilodactylus* (the Morwhangs), *Nemodactylus*, *Dactylophora*, *Psilocranium*, and *Mendosoma*,—this last a Chilian genus.

The SCORPÆNIDÆ are more remarkable than numerous; *Sebastes* and *Scorpæna* are widely distributed genera, but the others are for the most part confined to Australian waters, and are some of them of peculiar forms. Among these are *Glyptanchen*, *Pteros*, *Centropogon* (some of them · river fish), *Holoxenus*, *Pentaroge* (the Forty-skew), *Agriopus*, *Aploactis*, and *Synancidium*.

The TEUTHIDIDÆ number about 10 species, with one or two exceptions all inhabitants of the coral reefs of the north, and of wide range. The BERYCIDÆ are few; there is a fine *Beryx* (the Nanygai), found on the East Coast. Three species of *Trachichthys* (a very extraordinary form, peculiar to Australia and New Zealand) are known. *Monocentris* is said to have been found, and the few species of *Myripristis* and *Holocentrum* included in the list of Australian Fishes are all from the tropical parts of the country.

There are five or six species of the KURTIDÆ, of the genera *Pempheris*, *Neopempheris*, and *Kurtus*. The POLYNEMIDÆ are met with chiefly in the estuaries of the Queensland rivers, and even in fresh water; there are in all six species known to be inhabitants of Australia, and some of these attain a great size.

Six or seven species of SCIÆNIDÆ are also found in Australia. The Sciæna of the Mediterranean is said to be the same as the Australian *Sciæna Antarctica*. *Otolithus*, or Teraglin, is a well-known Fish in Sydney. The other two genera, *Corvina* and *Umbrina*, seem to frequent the estuaries and river mouths of Queensland. The XIPHIIDÆ and TRICHIURIDÆ are represented, but being Fishes of enormous range they present no Australian peculiarity. The ACANTHURIDÆ are numerous, but inhabit chiefly the coral seas of the North and for the most are identical with the species of the Polynesian seas. The CARANGIDÆ are in Australia, as in some other parts of the world, a most important family. They number about 40 Australian species, chiefly of the genus *Caran*, and are most abundant in the warm latitudes, while the genus *Seriola*, including the "King Fish" and "Samson Fish" of Sydney, and the "Yellow Tail" of Melbourne, fishes of very large size, are only found in the temperate zones. The genus *Neptonemus* is the only one of limited range, and that extends to New Zealand. The NOMEIDÆ, CORYPHÆNIDÆ, and CYTTIDÆ, everywhere families of small extent, are in Australia represented by two species each, *Nomens Gronovii* and *Platyslathens cultratum*, a genus limited to Norfolk Island and New Guinea, of the first of these families; *Coryphæna punctulata*, and *Brama Raii* of the second, and *Cyttus Australis* (John Dory) of the third. The SCOMBRIDÆ are all Ocean Fishes, and of unlimited range; they are therefore all found, as might be expected, in one or another part of the Australian seas. All, or nearly all, the genera are represented, and a few new species have been described, but there seem to be no marked or distinctive local characters. The TRACHINIDÆ include some very remarkable Australian forms. Among the group URANOSCOPINA are the extraordinary genera *Kathetostoma* and *Leptescopus*. Among the TRACHININA are *Percis*, *Sillago*, *Aphrites*, and *Bovichthys*,—almost exclusively Australian or South Pacific forms. *Opisthognathus* is another curious genus abundant in these seas, though not exclusively confined to them. The BATRACHIDÆ are represented by four species of the genus *Batrachus*. Of the PLEDICULATI there are 12 species of *Antennarius*, chiefly from the tropical regions of Queensland, and three species of the curious Tasmanian genus *Brachionichthys*. The COTTINA are richly represented by the genus *Platycephalus* (the Flatheads), which abound in all the Indian seas. Twenty species are found in Australia, some of them being among the most valuable food fishes of the country; the other Australian COTTINA are limited to a few species of *Trigla*, *Lepidotrigla*, and *Dactylopterus*. The GOBIIDÆ are numerous, but do not seem to differ much from those of other parts of the world. The species are chiefly of the genera *Gobius*, *Apocryptes*, *Gobiosoma*, *Gobiodon*, *Periopthalmus*, *Eleotris*, and *Callionymus*; the only entirely Australian genus is *Aristeus*, which Castelnau has placed with this family. It is found in rivers only. The BLENNIDÆ are numerous and some of them of eccentric appearance, the genus *Patæcus* most remarkably so. The genera richest in species are *Petroseirtes*, *Salarias*, and *Cristiceps*. There are several other genera, but with few species. The SPHYRÆNIDÆ are represented by two species of *Sphyræna* and a genus (strictly Australian) possessing one species, *Lanioperca mordax*, generally placed in this family.

The ATHERINIDæ seem to be abundant about the river mouths in all parts of Australia, but only a small number have been described, and these, with the exception of the genus *Nematocentris*, present no remarkable features.

The MUGILIDÆ number about 25 species; they are to be seen sometimes in enormous shoals, and are inhabitants of the coasts, estuaries, and rivers. The species differ on different parts of the Coast, but they are everywhere fishes of the finest quality, and might be converted into a most valuable article of export. The genera are *Mugil*, *Agonostoma*, and *Myxus*, the last two solely Australian.

The curious Gasterosteiform fishes, the FISTULARIDÆ, are represented by one *Fistularia* and one *Aulostoma*; the CENTRISCIDÆ by two species of *Centriscus* and two of *Amphisile*. The GOBIOSCIDÆ possess two genera in Australia, the Tasmanian genus *Crepidogaster*, of which there are two species, and one species of *Gobiesox*.

The OPHIOCEPHALIDÆ are represented by one species only—*O. striatus*, *Bl.* The TRACHYPTERIDÆ are seldom seen. *Regalæcus gladius* is said to have been caught on the Tasmanian Coast. *Regalæcus Jacksonensis* has been described by Ramsay from Port Jackson from one specimen, and a specimen of *Trachypterus Altivelis Kner* has been lately taken on the East Coast of Tasmania. One species of the NOTACANTHI, *Notacanthus sexspinis*, has been taken in King George's Sound.

The POMACENTRIDÆ are numerous in the warm latitudes of North Australia. *Parma* and *Gliphydodon* are the only genera found in the temperate regions.

The LABRIDÆ must number quite 100 species in Australia. The genera are for the most part identical with those of the Indian Seas. There are 17 genera in all. The most numerous in species of those inhabiting tropical seas are *Chœrops* and *Pseudoscarus*. The most populous genus of the Southern Coasts is *Labrichthys*, which numbers nearly 40 species. A very extraordinary genus—*Siphonognathus*—perhaps the most marvellous looking fish in existence, is placed by Gunther in this family, and in the group ODACINA It is found on the South Australian Coast.

The next Order of Fishes—the ANACANTHINI—are not largely represented in Australia, but an Australian character is distinct throughout. The GADOPSIDÆ constitute a strictly Australian family, having only one genus and one species. It seems to form a link between the Acanthopteryginous fishes and the Gadidæ. It is found in most of the rivers of New South Wales, Victoria, Tasmania, and South Australia.

The LYCODIDÆ are represented by a single species of a single Australian genus, found in Northern Queensland. The GADIDÆ, which occupy such a prominent position in other regions, both for their numbers and their value to the human race, are here few in number and unimportant, being limited to a few species of *Lotella*, *Physiculus*, and *Pseudophysis*. The Ophididæ are far from numerous, but are sufficiently interesting. A species of *Dinemolichthys* comes from the extreme North. A *Genypterus* (two feet long) is found in Hobson's Bay. *Typhlonus* and *Aphyonus* are genera found at great depths ("Challenger") on the North-east Coast, and *Fierasper* and *Congrogadus* come from the coral reefs of the North. The Macruridæ of Australia consists of one species of *Macrurus* and three of *Coryphænoides*, all from the South Coast, one at a depth of 2000 fathoms ("Challenger.")

The Pleuronectidæ of Australia number about 40 species. They are probably much more numerous, as the use of the trawl net, the only means of catching them, has never been introduced into the country. The well-known genera and species of this family in the European seas are represented in Australia by different genera for the most part, but there is nothing conspicuously distinctive. The Siluridæ are not numerous. Several genera are found in the fresh waters of the northern portion of Australia, and a fine species of *Copidoglanis* is abundant in most of the inland rivers. The genus *Cnidoglanis* is abundant on the East Coast. Species of *Arius* are found among the coral reefs.

The Scopelidæ are deep sea fishes, and probably widely distributed. The genera chiefly represented in Australia are *Saurus* and *Saurida*. The beautiful *Aulopus* (Sergeant Baker) is not uncommon. *Scopelus* and *Alœpidosaurus* are also found occasionally. Of the Stomiatidæ two species have been found at depths of over 2000 fathoms, one on the North-west, the others on the South Coast ("Challenger.")

The great family of Salmonidæ is entirely unknown in Australia, with the exception of two very curious genera, each of one species, found in the rivers of the colder regions of the south. These are the genera *Prototoctres*, a small fish found in the Victorian and Tasmanian rivers, and *Retropinna*, also found in New Zealand rivers. The Galaxidæ constitute a family remarkable in many respects. They are found only in the rivers of the extreme south of South America, of the Falkland Islands, of the South of New Zealand, of Tasmania, of Victoria, and the rivers of New South Wales flowing from the great mountain range of the country. The peculiar distribution of these very peculiar fishes gives support to the belief held by many scientific men that a great Antarctic Continent at one time extended from America to Australia. About 20 species of the one genus *Galaxias* have been described from Australia.

All the genera of the Scombrescodiæ are found in

Australasia. One genus—*Hemirhampus*—containing several species, all known as "Gar Fish," is highly valued as an edible fish. The large families of Cyprinidæ and Cyprinodontidæ are unrepresented in Australia. One species of the Gonorhynchidæ is found on the South Coast. In the northern rivers of Queensland a large fish of a semi-Ganoid character is found; it is the *Burramundi* of the Aborigines, and is of the genus *Osteoglossum*, a genus known to exist also in rivers of tropical America and the East Indies. It is one of the most remarkable of Australian fishes.

The Clupeidæ are rather numerous; about 25 species are recorded in Macleay's catalogue. They are chiefly of the genera *Engraulis* and *Clupea*, and several of them frequent fresh water. One species—*Clupea sagax*—almost identical with the English Pilchard, visits the coasts of Victoria and New South Wales at certain seasons in vast shoals, but no attempt has ever been made to catch and utilise them. A species of the Alepocephalidæ was dredged by the "Challenger" naturalists from a depth of 1400 fathoms in North Australian waters. The Symbranchidæ of Australia consists of one species of *Symbranchus* and two of *Chilobranchus*, a genus peculiar to Australia. The Murænidæ are abundant in the seas and many of the rivers of the country. The genus *Muræna* is most numerous about the coral seas of the north. The two very remarkable, though very distinct forms, *Leptocephalus* and *Pegasus*, generally ranked with the "Teleostei," are found in Australia.

The Order LOPHOBRANCHII is nearly Australian; that is, out of a total for the world of about 100 species there are nearly 50 Australian. Most of the genera known in other parts are represented, while there are several genera known only from Australia.

The Order PLECTOGNATHI is also of a decidedly Australian character. The Sclerodermi, out of a total of about 100 species, number over 50 Australian, chiefly of the genus *Monacanthus* and *Ostracion*; while the Gymnodontes, out of a total of 80 species, number quite 30, and several of the genera are solely Australian.

A species of *Orthagoriscus* seems to attain an enormous size in the Australian Ocean.

The Ganoidiæ, if represented at all, are represented by a very anomalous fish, peculiar to the Burnett and Dawson Rivers of Queensland. It is of the family Sirenoideæ, and is the analogue of the *Protopterus* of the rivers of tropical Africa, and of the *Lepidosinen* of the River Amazon of South America. Mr. Krefft first discovered its affinity to the fossil genus *Ceratodus*, of Agassiz, and named the genus *Ceratodus Forsteri*. The Embryology and mode of reproduction of this curious fish has been investigated lately by Mr. Caldwell, a distinguished science student of Cambridge, and he has found its affinity in these respects to the Newt extremely close.

One species of the CHIMÆRIDÆ, of the genus *Callorhynchus* is found in the cold seas of the south. The PLAGIOSTOMATA occupy a marked place in the Fauna of Australia. The SELACHOIDEI, or Sharks, number about 40 species, in a total of about 126. All the main groups or families are included in the 40 species, and one family, consisting of the genus *Heterodontus*, may be regarded as almost an Australian form. It seems to have been common in the Jurassic period, but the only species known at the present day are two species Australian, one Californian, one Japanese, and one Galipago Islands. It is known in Australia as the "Port Jackson Shark." A remarkable discovery has lately been made of a large specimen of the Arctic Basking Shark (*Selache maxima*) on the South Coast of Victoria, near Portland Bay.

The BATOIDEI are not quite so proportionally numerous in Australia, being only about 25 species in a total of 140, but still a large proportion. All the families are represented, and some of the species are of great size. A specimen of *Ceratoptera* in the Australian Museum, Sydney, is of gigantic dimensions.

Of the Order MARSIPOBRANCHII, the Family PETROMYZONIDÆ is represented by a species of *Mordacia*, a genus found also on the Chilian Coast, a species of *Neomordacia* exclusively Australian, three species of *Geotria*, a genus also found on the Chilian Coast, and one species of a strictly Australian genus *Yarra*, all from fresh or brackish water on the South Coast. One species of the Australian *Amphioxus*, or Lancelot, may be readily obtained on almost all parts of the Coast of Victoria and New South Wales by dredging at some depth on a sandy bottom.

## SUB-KINGDOM MOLLUSCA.

The Mollusca of the entire world must number nearly, if not quite 30,000 fossil and recent species. The number of Australian species is about 5000. This is a large percentage (1-6th) for Australia; but the climate, the large sea-frontage, the nature of the coast-line, all combine to make Australia a favourable resort for this sub-kingdom.

There is less, however, in the Mollusca than in any other sub-kingdom of the Animalia of a peculiarly Australian character to be observed,—in fact, except in one or two not very important peculiarities, there is nothing to separate the region from the rest of the world. Of the Class BRANCHIOPODA there are only about 80 existing species. Of these eight are Australian, one of the CRANIIDÆ, the rest TEREBRATULIDÆ; six of them found in Port Jackson. The Class LAMELLI-

BRANCHIATA, which includes nearly all the Bivalves, is said to number in all, Recent and Fossil, 14,000 species, and as it is calculated that there are quite 2000 species of existing species of this Class, it is evident that they must be proportionally exceedingly numerous in Australia. Almost all the Families are represented, those most conspicuously so being the PECTINIDÆ, AVICULIDÆ, MYTILIDÆ, ARCIDÆ (including the Australian genus *Trigonia)*, UNIONIDÆ, TELLINIDÆ, SOLENIDÆ, and MACTRIDÆ. Of the Class PTEROPODA nearly every Family is represented, but there are not more than 15 Australian species known in all. The Class GASTROPODA, everywhere numerous, quite keeps up its character in that respect in Australia. The Order SCAPHOPODA is represented by 15 species of the DENTALIDÆ. The Order OPISTHOBRANCHIA is well represented. Of the Section ABRANCHIA there are six species. Of the NUDIBRANCHIA 125 species, of all the families. Of the INFEROBRANCHIA three species of *Plyllidia*; and of the TECTOBRANCHIA about 50 species, belonging to all the families. Of the next Order of the Gastropods, the PSOROBRANCHIA, there are little short of 1500 species in Australia against a total of 12,000. All the Families are to be found in Australia, but some in more than average abundance. The VOLUTIDÆ alone number 200 species, and Australia is considered the metropolis of the genus VOLUTA; the CYPRINIDÆ, CONIDÆ, TEREBRIDÆ, and MURICIDÆ are also very numerous. A species of the LITTORINIDÆ of the genus *Raulinia* is found alive in New South Wales, while another species of the same genus is found fossil in the Paris Basin. The last Order of the Gastropods, the PULMENIFERA, are sufficiently numerous, but only two of the five families are included in the Australian Fauna,—the AURICULIDÆ, of which there are about 100 species, and the HELICIDÆ, numbering in Australia nearly 400 species. Australia is regarded as the true home of the genus *Helix*. Of the small class of HETEROPODA, few in number everywhere, there are in all eight Australian species, belonging to the genera *Janthina* and *Reclusia*.

The CEPHALOPODA are abundant on the Australian Coasts. There are two species of *Nautilus*, one of *Spirula*, four of *Sepia*, two of *Sepiola*, ten of the *Loliginidæ*, three of *Octopus*, and three of the *Argonautidæ*. The Class TUNICATA are apparently very numerous, the ASCIDIOIDIA particularly, but they have never been much studied, and really very little is known about them. Of the BIPHORA there are four species of the *Salpidæ*.

The third Sub-kingdom of the Animalia, the ARTHROPODA is, as in all parts of the world, exceedingly numerous in species. Pascoe calculates their numbers at 200,000. Of the four classes into which the Sub-kingdom is divided, the Insecta are very much the most numerous, and the position they occupy in the Australian Fauna will be best ascertained by taking the different Orders in succession.

Though all or nearly all of the most important Families of the various Orders are well represented, yet the genera are as a rule so distinct from those of other parts of the world, that anyone having the slightest acquaintance with Entomology would at a mere glance recognise an Australian collection.

The Order COLEOPTERA is the most numerous and best worked out in Australia of all the Orders of Insecta. The numbers of this Order for the whole world are estimated at 80,000, and of these quite 10,000 may be quoted for Australia, and it is probable that in a few years' time thousands may be added to that estimate.

The CICINDELIDÆ are not very numerous, and the most noticeable feature about them is the appearance of the African genus *Megacephala* and the South American genus *Tetracha*. The Family of the CARABIDE is a very large one, and presents marked peculiarities. The true CARABIDÆ, containing the genera *Carabus*, *Tefflus*, *Cychrus*, *Leistus*, *Nebria*, *Elophrus*, *Omophron*, &c., are entirely unrepresented, except by two species of *Calosoma* and the Australian genus *Pamborus*.

The TRUNCATIPENNES are also very numerous, but they differ very much from the Truncatipennes of other countries. A numerous group, the *Helluonidæ*, are almost exclusively Australian, as are also the genera *Xanthophlæa*, *Homothes*, *Sarathrocrepis*, *Philophlæus*, *Agonochila*, *Cataseopus*, *Scopodes*, *Silphomorpha*, and *Adelotopus*.

The MORIO group is fairly numerous, and includes the largest known Carabideous insect (*Campylœnemis Schrœtten.*) The BIPARTITI are numerously represented in Australia by a section of the Sub-Family of SCARITIDÆ, originally all contained in the Fabrician genus *Carenum*. It is now divided into ten genera, and comprises over 200 species. The FERONIDÆ and HARPALIDÆ are also numerous, but are, with a few exceptions, very like insects of the same families elsewhere. The BEMBIDIIDÆ seem to be few, but is not unlikely that their small size may have caused them to escape the notice of collectors. The Families DYTISCIDÆ and GYRINIDÆ are not numerously represented, and exhibit no peculiar characteristics.

The PALPICORNIA are few in species, but all the families are represented.

The STAPHYLINIDÆ are remarkably few in number; the PSELAPHIDÆ seem to be abundant. The Clavicorn Beetles are not very numerous, but most of the families have their representatives—the Paussidæ, in the genus *Arthropterus*, 40 species; the Scydmænidæ in the genera *Scydmænus*, *Heterognathus*, &c., in all 16 species; the Silphidæ, in one species of *Ptomaphila* and two of *Choleva;* and the Scaphididæ, by six species.

The Histeridæ number 25 species; the Phalacridæ one species; the Nitidulidæ 30 species, chiefly of the genera *Brachypeplus* and *Carpophilus*. The Trogositidæ are represented by the curious genus *Leperina*. The Passalini are well represented; the Colydiidæ by *Meryx*, *Deretraphus*, *Bothrideres*, and other genera, in all about 40 species. The Cucujidæ and all the other families are sparingly represented. The Lucanidæ are not numerous, the prevailing forms being of the genera *Rhyssonotus*, *Lamprima*, *Dorcus*, *Lissotes*, *Figulus*, &c.

The Lamellicornia are not numerous, but they possess in a marked degree a distinct Australian character. The country is singularly deficient in the large Copridæ, though there are a good number of such genera as *Onthophagus* and the entirely Australian genera *Cephalodesmius* and *Tesserodon*. The Sub-Family Cetoniidæ are few in species; they consist for the most part of beautiful insects of the almost entirely Australian genus *Schizorhina*, though in the Northern districts the Indo-Malayan genus *Lomaptera* makes its appearance. The Rutelidæ of other parts of the world are here represented by the very showy genera *Anoplognathus*, *Repsimus*, and *Calloodes*. The Melolonthidæ are very numerous, the most characteristic Australian genera being *Diphucephala*, *Phyllotocus*, *Mæchidius*, *Liparetrus*, &c. The Dynastidæ are not numerous, but there are a few large and remarkable species of the family found in the country. The genera *Bolhoceras*, *Tro*, and the remarkable Australian genus *Cryptodus*, abound in species.

The Sternoxi are as abundant in Australia as in any part of the world. The Buprestidæ are enormously numerous, the most characteristic Australian genus *Stigmodera* possessing over 220 described species. The Throscidæ and Eucnemidæ are few in number. The Elateridæ are very numerous, the chief genera being *Alaus*, *Tetralobus*, and *Monocrepidius*.

Of the MALOCODERMES Australia possesses no Cebrionidæ; several Rhipiceridæ of the genera *Rhipicera*, and *Callirhipis;* two species of the Dascillidæ; and of the Telephoridæ a very limited number, chiefly of the genera *Metriorrhynchus*, *Telephorus*, *Laius*, and *Carphurus*. The Cleridæ number over 100 species, many of them of genera almost entirely Australian. The other families of the Malocodermes are very sparingly represented.

The TETRAMERA are abundant, but show a remarkable absence of some of the most populous groups of other parts of the world; thus the Tenebrionidæ in Australia, though numerous enough, show few of the European, American, and African Sub-Families, and are chiefly represented by the genera *Amarygnus*, *Adelium*, *Cephaleus*, *Heleus*, and genera allied to them. The genus *Zopherosis* is one of the most remarkable of the Australian forms. All the Trachelidous families of the Heteromera are present, but some, as the Cantharidæ and Melandryidæ, very sparingly.

The TETRAMERA are very numerous. The Rhyncophara alone must number in Australia quite 2000 species; the groups formed of the genera *Leptops*, *Catasarcus*, *Amycterus*, *Psalidura*, *Gonipterus*, *Rhinaria*, and the host of genera formed out of them, are among the many characteristic Australian forms in this division of the Tetramera.

The XYLOPHAGA are few in number.

The LONGICORNIA, on the other hand, abound. About 550 species have been described, chiefly by Mr. Pascoe; the genus *Phoracantha* among the Cerambycidæ, and *Symphyletes* and *Penthea* among the Lamiidæ, form the largest Australian groups. The Phytophaga are extremely numerous as a whole, particularly the families Cryptocephalidæ and Chrysomelidæ; in the latter family the genus *Paropsis*, an Australian form, numbers over 200 species. The Eupodidæ are few, but include the noticeable genera *Carpophagus* and *Megamerus*. The Cassididæ and Hispidæ are very few in number. The Halticidæ and Galerucidæ are fairly numerous. The Erotylidæ are limited to about 10 species, mostly of the genus *Episcapha*. The Australian Trimerous Beetles consist of a few of the Aphidiphaga, of the genus *Epilachna*, and a very few of the *Fungicola*.

The next Order, the HYMENOPTERA, have not been so much attended to as the Coleoptera, so that no estimate can be formed of their numbers, but they are undoubtedly very numerous. The Cynipidæ, Chalcididæ, Proctotrupidæ, and Ichneumonidæ are not only numerous, but they present some very remarkable forms. The Formicidæ are still more abundant. The Fossores are also very numerous, the genus *Thynnus* constituting the most strictly Australian group. The Apidæ are not very numerous. The Tenthridinidæ are represented only by the genera *Perga* and *Nematus*.

The Order ORTHOPTERA is, if not so numerous as the other Orders, quite as remarkable. Blattidæ are numerous; the Mantidæ and Phasmatidæ of Australia are remarkable for their size and beauty. The Gryllidæ contain species of very singular forms, and the Acridiidæ include some very destructive species of *Œdipoda* or Locusts. The Euplexoptera (Earwigs) are also numerous.

The **NEUROPTERA** and **TRICHOPTERA** have been little studied in Australia, and, with the exception of the large-sized species, are little known, but they are certainly rather numerous on the whole, the Ephemeridæ being the least numerous, and the Termitidæ the most so.

The **LEPIDOPTERA** form everywhere a very populous Order, and nowhere more so than in Australia. It is difficult to guess even at their probable numbers; but Mr. Meyrick, who has been engaged upon the Microlepidoptera for some years, estimates their number at many thousand species. The Diurnal Butterflies of Australia consist, according to Masters's Catalogue, of 200 species, but the greatest number of these are from Northern Queensland, and are evidently originally migrants from the Indo-Malayan region; among these may be ranked the magnificent genus *Ornithoptera*, of which four species or varieties are found in Australia.

The readiness with which some Butterflies change their residence is exemplified by the passage of an American Butterfly (*Danais Erippus*, Cram.), of late years from the west coast of America to Australia, and its now complete voluntary acclimatization in that country. *Eurycus* is the only entirely Australian genus among the Papilionidæ; but among the Day-flying Moths there are several, such as *Synemon*, *Euschemon*, *Damias*, and *Agarista*. The Sphingidæ, Bombycidæ, Noctuidiæ, and Geometridæ are numerous, handsome, and many of them of large size. The Microlepidoptera seem to be in incalculable numbers. Mr. Meyrick calculates the Œcephoridæ alone at 2000 species.

The **DIPTERA** is also an Order extremely rich in numbers, but the smaller and more numerous of the Australian groups have never been studied. Schiner, in "The Diptera of the Novara," estimates the Diptera of the world at 19,449 species, and of these he gives only 1056 to Australia. Three times that number would probably be under the mark. The Cecydomyidæ, for instance, are very numerous in Australia, and yet only three species have been described.

The Jabanidæ, Asilidæ, Acroceridæ, Bombyliidæ, and Muscidæ are very numerous, and present some local peculiarities. Syrphidæ, on the contrary, are rare, and the Œstridæ are unknown.

The **HEMIPTERA** and **HOMOPTERA** are numerous, and most of the families are represented. Of the first of these Orders the Reduviidæ are the most largely distributed. The Hemiptera are not only numerous but are most peculiar and interesting; most of the families however, more particularly the Coccidæ and Psyllidæ, are almost unknown.

The Class **ARACHNIDÆ** are numerous proportionally to the rest of the world. The Phalangiidæ are very few, but the CHELIFERA and Scorpions abound; the Spiders are extremely numerous, and of many families, and the ACARIDÆ, IXODIDÆ, TROMBIDÆ, GAMASIDÆ, &c. abound throughout the country. The Class MYRIOPODA comprises in Australia numbers of JULIDÆ, and an amazing number of species of SCOLOPENDIDÆ.

The CRUSTACEA, the last Class of the Anthropoda, are, as far as the Malacostracea are concerned, well known. Mr. Haswell, M.A.,B.Sc., having lately completed an excellent catalogue of them. The number of species by that catalogue is 538, which, with others described since, will probably bring the total to 600. Mr. Haswell has also lately published a paper on the PYCNOGONIDÆ of Australia, about eight in number.

The other Sub-classes of the Crustacea, the ENTOMOSTRACA, EPIZOA, and CIRREPEPIA, are undoubtedly numerous, but they have been very little studied.

The VERMES, the fourth Sub-kingdom of Animals, are in all their heterogeneous Classes well represented in Australia, but with the exception of some groups of the ANNELIDÆ and POLYZOA, are very little known. Mr. Haswell has lately described a number of the Australian forms of the Order CHÆTOPODA. The OLIGOCHÆTA are few in number, but comprise one at least giant species. HIRUDINIDÆ are numerous. The SCOLECIDA are probably as numerous in Australia as in any part of the world, but no one has paid much attention to them. All the Mammals, Birds, and Fishes seem to be well stocked with them, all probably distinct species; but the genera seem to be the same as in other places. All, or nearly all, the Entozoa of man and the domestic animals are found in Australia, but they probably came with the European.

The ROTIFERA are believed to abound. *Sagitta* is found.

The Fifth Sub-kingdom of Animalia, the ECHINODERMATA, are exclusively Marine Animals, and in a country with an extensive seaboard and a favourable climate like Australia, might be expected to hold a predominating position, and they do so.

The vast mass of coral reefs and islands known as the Barrier Reef, extending from the latitude of about 25° to 8° south, or until it reaches New Guinea, skirting the East Coast of Australia for over 1000 miles at a distance varying from three to ten miles from the coast, enclosing a smooth and warm sea, and receiving through numerous passages the clear waters of the ocean without, offers for all Marine Animals a haven of the most tempting character, and the Echinodermata seem to have availed themselves of it to an unprecedented extent. But the prevalence of Echinoderm life is not confined to such favoured regions,—throughout all the Australian seas it appears in various forms. The four Classes CRINOIDEA, ECHINOIDEA, STELLARIA, and HOLUTHUROIDEA are all very numerously represented in proportion to their numbers throughout the rest of the world. Some of the species of one of these Classes, the Holuthuridæ, furnish a valuable article of commerce to China known as "trepang" or "bêche-de-mer."

The Sub-kingdom CŒLENTERATA is evidently largely represented in Australia, but as yet but little has been done in the examination of it. Dr. Von Lendenfeld has lately been investigating the Class of Spongia, which he has found so numerous and peculiar on the Australian Coasts as to necessitate a change in nomenclature and classification.

The Order CALCAREA or CALCISPONGIA he has found to number 53 species, and three of the families—Homodermidæ, Leucopsidæ, and Trichonidæ—are peculiar to Australia. The Mysospongiæ are few in number; but there is an interesting genus, Bajatus, peculiar to Australia.

The CERAOSPONGIÆ are found by Dr. Lendenfeld to be richer in species in Australia than in the rest of the world united.

The MONATICERÆ also predominate in Australian waters.

The HEXACTINELLIDÆ and TETRACTINELLIDÆ are few in species.

The MONACTIPHALEÆ are numerous enough, but not proportionally so as compared with other parts of the world.

The Class ANTHOZOA is also well represented. Of the Order ALCYONARIA, five Pennatulidæ are found, and Gorgonidæ are abundant.

Of the ZOANTHARIA, the Actiniidæ are chiefly found in the cool waters of the temperate regions, the Sclerodermata in the tropical parts, the Medreporidæ forming the chief part of the extensive coral reefs which surround the North Coast.

The Class HYDROZOA are, as a whole, also abundant. The HYDROMEDUSÆ of Australia number 243 species, the Polyp-colonies, with chitinous skeletons, predominate; the Australian Sertularidæ and Plumularidæ exceed in number those of the rest of the world added together; the ephemerous Eucapillidæ are peculiar to Australia. Large Trachomedusæ are comparatively rare.

The *Hydra* is found in Australian rivers. The Syponophara are rare, and show no peculiar forms.

Of the Order SCYPHOMEDUSÆ only 26 Australian species are known, but additional species may be expected from better acquaintance with the productions of the seas on the north coast. The very curious genus *Pseudorhiza* is peculiar to Australia. The RHIZOSTOMÆ constitute the chief Australian group. The CTENOPHORA are present in Australia, but in very small numbers, as far as at present known. The Orders EURYSTOMATA, SACCATÆ, and TÆNIATÆ are each represented by one or two species. A very beautiful Beroid has been described from Port Jackson.

The last Sub-kingdom of the Animalia, the PROTOZOA, may be passed over: they are much the same everywhere. The Australian representatives of the various classes comprising the Sub-kingdom have never been investigated.

WILLIAM THOMAS STRUTT,
GOVERNMENT PRINTER, TASMANIA.

# ECLIPSE OF MARCH 30-31, 1885.

By A. B. Biggs, Launceston

(*Read April* 14, 1885.)

Before giving my notes of the recent partial eclipse of the moon, I wish to refer to the total lunar eclipse of last October (not visible here). Reports from observers of that event nearly all agree in laying stress upon one particular characteristic, namely, the absence on that occasion of the usual faint coppery illumination (caused by the refraction of the sun's rays into the earth's shadow by our atmosphere), by which the moon continues conspicuously visible throughout the phase of totality. The darkened moon was also unusually dark, and was by some described as invisible.

In consideration of the above circumstances, the recent eclipse, although not total, was so nearly so that it was looked forward to with particular interest, and I determined to make the best of the opportunity, with special reference to the moon's appearance in shadow. Fortunately, the circumstances were most favourable, the moon being free from clouds throughout. I commenced observing shortly after midnight. The penumbra was then gradually creeping over the south-east limb, though more apparent to the naked eye than in the telescope. The ruggedness of this portion of the moon's surface was at this time distinctly visible even in the profile of the full orb (in the telescope, of course). At 0h. 48min, this ruggedness vanished on the approach of the shadow, and seven minutes later this portion of the outline itself was lost. As the shadow advanced, that part within the moon's outline, adjacent to the point of intersection, on each side appeared considerably lighter than the general shadow, gradually deepening into the shadow resting on the body of the moon. About 1h. 10min. about fifteen degrees of the moon's outline on each side was visible *within the shadow.* This increased, during the middle of the eclipse, to what I judged to be about twenty-five degrees, this portion of the edge appearing as a sharp faint rim of light, gradually fading away into the shadow. With the above exception, all within the shadow was *utterly obliterated*—lost in the dead slaty tint of the sky. I could not discover a single crater or feature after it was fairly within the shadow, although on other occasions, even while totally eclipsed, I have been able to distinguish clearly all the principal features of the moon. *There was not the slightest trace of the coppery tint discernible throughout this eclipse.*

The shadow advanced until at 2h. 20min. it bisected the crater Plato, remaining stationary until 2h. 23½min. At 2h. 25min. Plato had emerged from shadow, and the middle of the eclipse had passed.

# FRESH CONTRIBUTION TO OUR KNOWLEDGE OF THE CHARACTER AND THE RELATIONSHIP OF THE UPPER PALÆOZOIC AND MESOZOIC FORMATIONS OF TASMANIA WITH THE ASSOCIATED DIABASIC ROCKS.

By Robt. M. Johnston, F.L.S.

*(Read April* 14, 1885.*)*

Recently I have devoted a considerable portion of my time to the renewed study of the relation of the prevailing diabasic rocks of the Southern portion of Tasmania, for which I have also recently had further opportunities afforded me by Webster, who most kindly took me in his yacht Ella to many places of interest in the numerous bays, channels, and arms of the sea towards the Southern part of the Derwent and Huon.

The relations of the lower marine beds to the diabasic greenstone between Passage Point and Long Bay in the accompanying diagrams unmistakeably show that the greater mass of the greenstone, as also shown by the recent bore test at the Cascades, is older than the overlying mudstones which quietly repose upon it. In one section, however, opposite Half-moon Bay, both the older greenstone and the mudstones are penetrated by an intrusive sheet of greenstone of later date. After abruptly ascending through the older greenstone, the later eruptive rock suddenly bends round, and forms a horizontal sheet of considerable extent between, and exactly parallel to the horizontal bedding of the mudstone and limestone series. This is the best example with which I am acquainted of the relation of the older and newer intrusive rocks with the marine sedimentary formation of upper palæozoic age.

I have also examined carefully the line of country between Hobart, Richmond, Constitution Hill, and Spring Hill. In many sections between the two latter places, the upper coal measures repose quietly upon the underlying diabase. The best example of this nature occurs in a cutting of the main road near Lovely Banks, where the unaltered shales and sandstones are seen to repose upon the diabase. The only exception noticed by me in this district occurs at the head of Spring Hill, where the later intrusive greenstone, apparently identical in character with the older, bursts through, dislocates, and overspreads certains beds of sandstone, which I believe to belong to the lower part of the coal measures.

At a section immediately beyond Mr. Bisdee's residence, at the foot of Spring Hill, Mr. T. R. Atkinson and myself discovered a very interesting series of finely laminated carbonaceous shales, which proved to be rich in plant remains. Various species of ferns of a new and interesting character were obtained belonging to the genera Pecopteris, Thinnfeldia, Odontopteris, Tæniopteris. One splendid specimen, with ovate lanceolate pinnules, which have peculiar laciniate margins, is peculiarly interesting, and may prove to belong to the genus Otopteris.

The distribution shows nothing but the remains of Phyllotheca and Zeugophyllites in certain beds and localities, while in contiguous or closely related beds hardly any other forms than those of Pecopteris, Thinnfeldia, and Tæniopteris, therefore great caution must be exercised for the present in separating beds of this system upon the evidence of organic remains only.

The restriction of particular forms to particular beds may only indicate a slight local difference in vegetation rather than difference in age or even horizon. However, on a future occasion, I will deal more fully with this important subject, for which I am now provided with many rich and interesting materials.

In conclusion, I draw attention to figures of some of the new plant forms from Spring Hill, Porter Hill, and the lower coal measures of the Mersey. The large imperfect frond from the Porter Hill beds, cythere shales, appears to belong either to the genus Cyclopteris or Gangamopteris. The spathulate frond found associated with Glossopteris Browniana from the lower coal measures of the Mersey is, I believe, identical with Noeggerathiopsis media of New South Wales.

The large equisetaceous impression from the same place, at the Mersey, is closely allied, if not identical, with a form of Schizoneura, figured by Feistmantel from the Lower Gondwana series, India.

# [*]JUNGERMANNIA RETICULATA.

BY R. A. BASTOW.

(*Read April* 14, 1885.)

The specimen now submitted for your observation under the microscope was gathered from the Springs on the side of Mount Wellington, on the 10th March last, close to a clear but somewhat rapid stream. After a protracted examination of the specimen, in its dry state, when moistened, as an opaque object, and as a transparent one mounted in glycerine medium, it appears to be different to any species of Jungermannia yet identified in Tasmania, and unlike any described in Flora Tasmania. It does, however, closely resemble *Jungermannia reticulata* as described in the Hepaticæ of Campbell's Islands, in No. 1, Vol. 1, of Flora Antarctica; the specimen is, therefore, rightly; or wrongly so named. Both a siccate and a mounted specimen of the plant have been submitted to Baron von Mueller, in order to obtain his opinion of the correctness of its classification. He referred me, in a long, kind, and encouraging reply, to the treatises by specialists in this Library, and which, in the meantime, I had carefully consulted, with the result just recorded.

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[*] This genus is named in honour of Louis Jungermann, a German botanist.

This Jungermannia grows as a low tuft, from 2in. to 3in. wide, and close to the ground. The stems are much entangled, and in general aspect are nearly black. As closely as I can make out, the direction of the leaves succubous, and there are remarkable auricular growths at their bases, in form reminding one of the clubs in which gymnasts take delight. These curious auricles appear also to proceed from the stem, as well as from the bases of the leaves, and probably take the place of the stipule lobes, as has been suggested by Sir J. Hooker with regard to similar appendages on plants of this and other genera. The appearance of the plant is beautiful under the microscope, and to those who have not made Hepaticæ a special study, it is extraordinary, especially as an opaque moist object, the club-shaped auricles then appear to advantage. The areolation of the leaves is very lax and pellucid, the cell-walls being clearly visible with a low power; the stem leaves appear to be entire or nearly so, and the upper ones are ciliated; the cilia are also very distinct with a low power. The colour of the leaves is from reddish-brown at the bases to yellowish green at the apices.

It may be assumed that beetles, ants, and such-like small creatures behold these minute forms as large growths, in like manner as we behold the lovely Acacia or the sombre Eucalyptus. To such small creatures the J. reticulata must offer a charming retreat, screening them, as it does, from the stronger light by its many-tinted diaphanous network of cell-structure, and its ruby evascular stems. They must, indeed, enjoy themselves, and live lives of pleasure as they luxuriate

"Beneath Hepatic's golden-pencilled shield,
Whose fronds of varied hue a close protection yield."

# NOTE REGARDING THE SILURIAN FOSSILS OF THE GORDON LIMESTONES, WITH GENERIC DESCRIPTIONS, AND A SPECIFIC LIST OF THE ORGANISMS ALREADY NAMED AND CLASSIFIED, BY VARIOUS AUTHORS.

By Robt. M. Johnston, F.L.S.

[*Read May* 12, 1885.]

Over thirty years ago the late Dr. Milligan obtained a very interesting series of Silurian Fossils from the Gordon River, in the vicinity of the Macquarie Harbour, which was subsequently lodged in the Society's Museum. This collection was supplemented by a suite of specimens obtained from the same locality by Mr. C. Gould in the year 1862. Prior to the year 1866, Mr. Gould made a selection of the most typical specimens, which he submitted to the judgment of Prof. M'Coy, who, according to Mr. Gould's account, " immediately identified several of the species and most of the generic forms." It is most unfortunate that in the account referred to, Mr. Gould, from want of access to his notes, was unable to give a complete list of the species so determined, and I have failed to find any trace of such list elsewhere in any of our local records. Mr. Gould, however, stated generally that the fossils belonged principally to the family *Orthoceratidæ*, together with corals *Murchisoniæ*, and species of *Raphistoma*, and that from such evidence the position of the Gordon limestones was referred to, " the very base of the lower Silurian of Europe, anterior to the described fossiliferous beds of Victoria, as well as to the Calymene, containing beds of the Eldon Valley," in Tasmania. In the year 1862, however, Mr. Gould gave a more definite enumeration of the more characteristic fossils then collected by him, as follows :—*Orthoceratites*, 2 sp.; *Lituites*, 1 sp.; *Halysites*, 1 sp.; *Favosites*, 2 sp.; *Raphistoma*, 1 sp.; *Orthis*, 1 sp.; *Rhynconella*, 1 sp.; *Euomphalus*, 2 sp.; *Murchisonia*, 3 sp.; in all 14 species so enumerated.

It is interesting to note, from his remarks at the time, that though the fossils are very abundant, and especially observable in sections of the limestone rock exposed to the action of running water, the different beds or zones in the formation are not equally fossiliferous, and that certain species are more or less limited in their distribution; corals abounding in certain beds, and univalve shells and large chambered orthocerata in others.

From that most valuable catalogue of Australian Fossils, by Rob. Etheridge, jun., I find a further and more extended series of specimens from *Tasmania West* (no doubt from the Gordon), was submitted to Prof. Salter prior to the year 1868. I have not yet ascertained by whom or from whence these fossils were transmitted to Mr. Salter, but it is of importance to note that 28 species were named and classified by him, and afterwards included in Bigsby's Thesaurus Sil., 1868. The following is a detailed list of the species, as enumerated in this work, and in Mr. Etheridge's catalogue :—

**BRACHIOPODA.**

| | | |
|---|---|---|
| Retzia | mima | *Salter* (M.S.) |

**MOLLUSCA PROPER.**

| | | |
|---|---|---|
| Cyrtodonta | auriculata | *Salter* (M.S.) |
| „ | compressa | „ |
| „ | distorta | „ |
| „ | gibbosula | „ |
| „ | inflata | „ |
| „ | obliquata | „ |
| „ | pinguis | „ |
| „ | reversa | „ |
| Tellinomya | amygdala | „ |
| „ | antipoda | „ |
| Bellerophon | pugnus | „ |
| Eunema (?) | æmula | „ |
| Helicotoma | Milligani | „ |
| „ | pusilla | „ |
| Holopaea | mumia | „ |
| Hormotoma | nerinæa | „ |
| „ | usitata | „ |
| Murchisonia | Franklinii | „ |
| „ | mimetica | „ |
| Raphistoma | æterna | „ |
| Scalites | Australis | „ |
| Trochonema | Bigsbyana | „ |
| Lituites | Gouldii | „ |
| Orthoceras | antilope | „ |
| „ | Murchisoni | „ |
| „ | Theca | „ |
| „ | Youngii | „ |

Here, again, it is to be feared, from (M.S.) references against each name, that the specific descriptions are not recorded, and, consequently, from this want we are unable to determine to what extent the species still preserved in the Society's Museum are included in the list so named and classified.

To add to our difficulty, there is no copy of Bigsby's useful work in the Society's Library, a want which should, if possible, be supplied.

It is clear, however, that the Society's collection of fossil Mollusca only contains a portion of the species classified by Mr. Salter, and it is most probable that the latter includes nearly all the species still remaining in the Society's collection. I also notice in the latter the following fossils, which do not seem to be included in Salter's list, namely:—Phragmoceras, 1 sp.; Pleurotomaria, 2 sp.; Euomphalus, 1 or 2 sp.; Orthis, 1 or 2 sp.; Rhynconella, 1 sp.; Corals, several species.

It is also worthy of record in this place that I have obtained fragments of a limestone rock similar in character to that of the Gordon and Point Hibbs from the New River, immediately to the south of the Craycroft, among which is the well preserved remains of a coral allied to the genus *Strombodes.*

Before any more specimens are sent away from the Society's collection for description or identification, I submit that it is most desirable to obtain detail descriptions of the larger collections classified already in the hands of European authorities or in European collections. With this end in view, and to aid me in dealing more satisfactorily with this subject in the work now under preparation by me for the Government of Tasmania, I had some time ago requested Mr. Robert Etheridge, jun., to furnish me, if possible, with full descriptions and figures of the species already referred to as contained in Bigsby's Thesaurus Sil. When Mr. Etheridge supplies this most necessary information, we will be all the better prepared to select for further determination such fossils still in the Society's collection as may have not been already described. To send away another typical collection at present would deprive local workers of the only source of reference available to them, and at the same time, as regards the greater number of species, only duplicate specimens already at the command of European authorities.

In the meantime, to facilitate reference to the species contained in the Society's collection, and to aid others who may not be in possession of works of reference, I have in the following part of my paper, with one or two exceptions, given a full description of all the genera which have been referred to in this paper as contained in the Silurian limestones of the Gordon River, in Tasmania. Prof. McCoy may, if applied to, be able to throw some light as regards the species identified by him in the collection submitted to his judgment by Mr. Gould about the year 1866.

## Description of Certain Genera found Fossil in the Silurian Limestone of the Western Part of Tasmania.

### Class Brachiopoda, (*Spiriferidæ*)

Retzia, *King*, 1850.

Bigsby's Thes. Sil. 1868; Eth. Cat. Aust. Fossils, P.; Tryon, iii., p. 324.

Shell punctuate, Terebratula shaped, beak truncated by a round foramen, rendered complete by a distinct deltidium; hinge area small, triangular sharply defined; interior with diverging shelly spires. (Silur-Trias.)

Retzia mima, Salter, M.S. Tasmania West.

Class PELECYPODA (Lamellibranchiata or Conchifera.)

Cyrtodonta *Billings* (*Cypricardites*, Conrad.)

Bigsby's Thesaurus. Sil 1868. Eth. Cat. p. 23. Austr. Fossils.

Shell ventricose, suborbicular or broad ovate in outline, with an external flattened ligamental area; cardinal teeth four to five; short oblique; lateral teeth two or more oblique; muscular impressions two (anterior one single ?); pallial line simple. (Tryon.)

| | | |
|---|---|---|
| C. auriculata. | Salter (M.S.) | Tasmania, West. |
| C. compressa. | ,, | ,, |
| C. distorta. | ,, | ,, |
| C. gibbulosa. | ,, | ,, |
| C. inflata. | ,, | ,, |
| C. obliquata. | ,, | ,, |
| C. penguis. | ,, | ,, |
| C. reversa. | ,, | ,, |

Eunema. *Salter.*

Bigby's Thes. Sil. 1868; Eth. Cat. Austr. Fossils, p. 24.

E. æmula. *Salter*, M.S. Tasmania West.

Straparollus, *Montfort*, 1816.

*Euomphalus* Sowb.,; *Helicotoma*, Salter.

Bigsby's Thes. Sil., p. 868; Eth. Cat. Austr. Fossils, p. 24. Tryon ii., p. 218.

Shell depressed; Whorls, angular or carinated; aperture, sub-quadrangular; umbilicus wide, conical; operculum shelly, multi-spiral. (Tryon.) Lower Silurian to Trias. United States, Europe, Australia.

| | | |
|---|---|---|
| S. æmula. | *Salter* (M.S.) | Tasmania, West. |
| S. (Helicotoma). Milligani | ,, | ,, |
| S. ,, pusilla | ,, | ,, |

Raphistoma. *Hall*, 1847.

Bigsby's Thes. Sil., 1868. Eth. Cat. Austr. Fossils, p. 25. Tryon II., p. 219.

Shell, lenticular, or orbicular; whorls, flattened, with a carination above; umbilicus, moderate; outer lip, with slight sinus at the keel. (Tryon.)

R. æterna. *Salter* (M.S.) Tasmania, West.

R. (Holopaea)

Scalites. (Conrad M.S.) Emmons, 1842.

Bigsby's Thes. Sil.. 1868; Eth. Cat. Austr. Fossils, p. 25. Tryon ii., p. 223.

Shell, turriculated; whorls, flattened above, angulated at the shoulder and convex below; outer lip, sinuous; umbilicus, none, or very small. Silurian. United States, Australia. (Tryon.)

S. (Holopea). Mumia. *Salter* (M.S.) Tasmania, West.
S. Australis, ditto „

### CLASS GASTEROPODA.

Bellerophon, De Montfort, 1808.
*Microceras.* Hall; Bigsby's Thes. Sil., 1868,
Eth. Cat. Aust. Fossils, p. 24. Tryon II., p 322.

Shell, symmetrically convoluted, globular, or discoidal; strong, few-whorled; whorls often sculptured; dorsally keeled; aperture, sinuated, and deeply notched on the dorsal side.

Cambrian to Carboniferous; North America, Europe, Australia, India. (Tryon.)

B. pugnus. *Salter* (M.S.) Tasmania, West.

Trochonema. *Salter*, 1859.
*Trochonemopsis*, Meek; Bigsby's Thes. Sil., 1869.
Eth. Cat. Aust. Fossils, p. 25. Tryon II., p. 309.

Shell, delphinula-like, with wide umbilicus. (Tryon.) Sil. Europe, America, Australasia.

Hormotoma. *Salter*, 1859.
Bigsby's Thes. Sil., 1863. Eth. Cat. Aust. Fossils, p. 25.

H. ncrinæa. *Salter* (M.S.) Lower Sil. Tasmania, West.

Murchisonia, *D'Archiac* and *De Verneuil*, 1841.
Bigsby's Thes. Sil., 1868. Eth. Cat. Aust. Fossils, p. 25.

Shell, elongated; many whorled; whorls, variously sculptured, and zoned, like Pleurotomaria; aperture, slightly channeled in front; outer lip, deeply notched. L. Silurian to Permian; North America, Europe, Australasia. (Tryon.)

M. Franklin. *Salter* (M.S.) Gordon Limestone, Tas.
M. mimetica. „ „ „ „

Tellinomya, *Hall*, 1847.
*Ctenodonta*, Salter, 1851.
Tryon iii., p. 260; Bigsby's Thes. Sil. 1868, p. 144.
Eth. Cat. Austr. Foss. p. 25.

Shell elongately oval, sub equilateral, smooth, or finely concentrically striate; valves moderately convex; hinge represented by two diverging comb-like denticulated margins, without a special hinge area between them and the beak, and below the latter, not interrupted by a pit; ligament apparently external, posterior to the beak. (Tryon.)

Silurian—Carboniferous. Europe, Bolivia, Australia.

T. amygdala, *Salter*, (M.S.) Tasmania, West.
T. antipoda, *Salter*, (M.S.) Tasmania, West.

### Class CEPHALOPODA.

Lituites, *Breynius*, 1732.

Bigsby's Thes. Sil. 1869; Eth. Cat. Aust. Fossils, p. 26; Tryon ii., p. 56.

Shell planorbiform, the whorls close or separate; the last chamber produced in a straight or outwardly curved line; lateral margins of the aperture extended and curved towards the interior of the shell, contracting the aperture into two distinct orifices.

Silurian. North America, Europe, Australasia. (Tryon.)
L. Gouldii.

Orthoceras. *Breynius*, 1732.

Bigby's Thes. Sil. 1868; Eth. Cat. Aust. Fossils, p. 26; Tryon ii., p. 51.

Shell straight, aperture sometimes contracted. (Tryon.)
L. Silurian to Triassic. N. America, Europe, Australasia.

| | | | |
|---|---|---|---|
| O. antilope. | Salter. M.S. | Gordon Limestone, | Tas. |
| O. Murchisoni. | " | " | " |
| O. Theca. | " | " | " |
| O. Youngii. | " | " | " |

Phragmoceras. *Brod.* 1839.
Tryon ii., p. 55.

Shell compressed on the sides, curved; aperture contracted in the middle; last chamber large; siphuncle dorsal, with radiations; septa simple.

Silurian to Devonian. Europe, N. America, Australasia.
One sp. in the Museum of the Tasmanian Royal Society.

## TASMANIAN MOSSES, THEIR IDENTIFICATION, &c.,

By R. A. Bastow.

[*Read May* 12, 1885.]

The Mosses of this and the neighbouring colonies are, like the fauna, singular and peculiar, presenting genera and species analogous in many respects to those of the British Isles, and yet many of them have some peculiarity of structure rendering them unique. In "Hooker's Flora Tasmaniæ" we have a great number of Tasmanian Mosses carefully described, and beautiful drawings of many of them are therein contained.

In turning over the plates of Mosses in that large and magnificent work, it will be seen that the plants vary in colour from the palest green, as in some Hypna, to almost black, as in Andreœa, and after a little thorough Moss hunting, we are able to form a fair idea of the genus to which the tuft belongs by its colour, its habit, and its locality. For instance, the sombre-looking Andreœa Petrophila loves the bleak rock, the feathery Hypnum selects to slumber in the sylvan shade, whilst the scarlet fringed Splachnum may rarely be found, except on decayed animal substances.

But closer observation than the above mentioned is required in order to precisely identify the genus to which a Moss Plant belongs, and this leads me to call your attention to the key to genera of Mosses of Tasmania now submitted to your notice. It will be observed that I have therein followed the principle that "the characters must all be derived from the number, form, proportion, and situation of the organs of fructification," and in so doing I only follow in the wake of eminent muscologists, such as Hedwig, Hooker, Schimper, Muller, Wilson, and Mitten.

In this key the Mosses are in the first place divided into terminal fruiting and lateral fruiting plants; this division at once ridding us of a host of genera as we proceed to identify. When a Moss has been carefully classed, as, for example, a laterally fruiting Moss, then the microscope must be brought into requisition to decide the remaining characters. They are as follows:—

The capsule, or theca of a Moss Plant, is supported on a pedicel or footstalk, called the seta. This is in some genera very long, and in others very short, and frequently forms a specific as well as a generic character.

The supported capsule varys in size and form, and is composed externally and internally of strongly marked parts. The capsules of Bartramia, or Apple Moss, are generally spherical; the Phascum capsule is ovate and bursts irregularly when ripe; Campylopus gracefully bends its neck and buries its oblong urn amongst its foliage; Tortula is elongated, and twisted in parts, whilst the robust Polytrichum is erect and quadrangular.

The capsules of many are furrowed, others are spotted, whilst the Hypna, and other genera growing in shaded nooks, are more frequently of slight fabric and smooth.

This graceful form of fruit is protected by a calyptra, or veil, in some genera dimidiate, and in others mitriform. From the character of the veil important generic distinctions are derived. If we gently raise the veil, the operculum becomes at once visible, and forms a tiny but perfect close fitting lid to the capsule. It is very long beaked in some genera, and scarcely convex in others; and forms another generic character. But the most interesting part of the capsule is the beautiful appendage, styled the peristome. It is a fringe of scarlet, pale yellow, purple, or intermediate shade. according to the genus to which the plant belongs. The peristome is divided into 8, 16, 32, or 64 segments or teeth. These numbers never deviate, a certain number of teeth are invariably found in a certain genus, they are always regular in number, and thus we have again strong characters for distinguishing genera.

In many of the Mosses the peristome is double, the inner one being much paler in colour than the outer, and in some few genera cilia may be found interposited with the teeth of the inner peristome. These are all abiding characters, and with the forms and arrangement of the leaves and habits of the plants, arranged, illustrated, and generically described as they are in the key before us, will be found sufficient in most cases to identify the genus to which the plant belongs.

May we be allowed to enter a plea for the Mosses of Tasmania which we so ruthlessly uproot from our garden walks and trample down by the road side; their forms are exquisite, their habits are in the charming corners and glades, as well as on the face of the mountain crag, their study is pure and refining, and there remains an insight to the student of contrivance, system, wisdom, Infinite Wisdom, and a source of infinite admiration.

# NEW SPECIES OF TASMANIAN MARINE SHELLS,

By W. F. Petterd.

[*Read May* 12, 1885.]

1. Pecten aktinos, n. sp.

Shell of moderate thickness, irregularly, elongately, and somewhat obliquely orbicular, depressed, marked with irregular prominent lines of growth, ornamented with numerous—fourteen to eighteen—radiating perceptibly imbricated riblets, which are alternatley large and small, and again covered with smaller liræ; cellular structure, distinctly visible under the lens, towards the base; ears unequal, moderately prominent; colour, pink to bright rose, with irregular light or dark bands, and again peculiarly marked with numerous small sharply angular patches of white to pink, shaded with deep brownish-red; interior, shining pinkish-white, with exterior colouration faintly showing through.

Long.—42 mill.
Lat.—36 „
Alt.—15 „

Habitat.—North-West Coast.

Though very distinct from the other Tasmanian forms, this species shows an approach to the common *P. asperrimus Lam,* but may be at once recognised by its form, smaller size, and very different colouration. It appears to be of rare occurrence, for, although I have seen numerous valves, but two perfect examples have come under my notice. It is probably a deep water form.

2. Diaphanna nivea, n. sp.

Shell, globose, very thin, semi-transparent, milky-white, shining; whorls, 4; spire, small, scarcely projecting, longitudinally streaked with fine lines of growth; aperture, narrowly ovate, inflated.

Long.—14 mill.
Lat.—7 „

Habitat.—Near River Leven (Miss Lodder). An unique example of a new genus to our Marine Molluscan fauna.

3. Cassis tumida, n. sp.

Shell, thick, white, dull, globose, marked with a few prominent lines of growth; whorls, 5; rounded, minutely, regularly, transversely lirate; spire, small, short, rather acute, apical whorls, smooth, suture emarginate; callus deposit, thin, striate, and shining; aperture ovate, inflated; outer lip, sub-reflexed, and slightly prominently thickened outside.

Long.—30 mill.
Lat.—18 „

Habitat.—Near River Leven (Miss Lodder). A single specimen collected of this small but distinct specie.

# DESCRIPTIONS OF NEW SPECIES OF FOSSIL LEAVES FROM THE TERTIARY DEPOSITS OF MOUNT BISCHOFF BELONGING TO THE GENERA EUCALYPTUS, LAURUS, QUERCUS, CYCADITES, ETC.

By Robt. M. Johnston, F.L.S.

[*Read June* 9, 1885.]

To Mr. Sprent, who is now taking a very active part in arousing the interest of Surveyors, and others throughout the island, in all matters connected with local geology, I am indebted for the opportunity afforded me for the examination of a very valuable collection of Fossil Leaf impressions collected by Mr. Kayser, the very able manager of the Mount Bischoff Tin Mining Company's works at Mount Bischoff. The fossil impressions are very numerous and well defined, in a somewhat greyish sandstone, whose position, I learn from Mr. Kayser, underlies that recent basaltic sheet, which, with associated tuffs, occupies a considerable portion of the country in and around Mount Bischoff, and also extends more or less uninterruptedly over a considerable portion of the Surrey and Hampshire Hills, and towards Emu Bay, where a fine exposed headland exhibits basaltic columns, remarkable for their prismatic form and regularity. These tertiary beds repose upon or flank the tin-bearing eurite porphyries and the older associated slates, which, with their detritus, form the principal elevated boss of Mount Bischoff. The mount in itself is not very conspicuous at a distance, as it rises from the great elevated undulating plateau, stretching throughout a very considerable portion of the west and north-west part of the island. The level of this plateau maintains a general altitude above the sea of from 1,500 to to 2,000 feet all along the western flanks of the greater inland greenstone plateau of the Lake Country, and for a considerable extent towards the northern and western coast line, towards which it ultimately slopes more or less gradually.

The leaf beds at Mount Bischoff, therefore, are at a very much higher level than those with which we are already familiar in the Tamar and Derwent Basins, which latter range in altitude from sea level to 600 feet. The collection made by Mr. Kayser is a very interesting one, as not only do all the forms discovered appear to belong to new species, but in some cases to genera not before discovered fossil in Tasmania. The prevailing form appears to be a species of *Oak*, allied to *Quercus drymejoides* Ettingshausen, found at Dalton, near Gunning, New South Wales. One of the most striking and beautiful forms, however, is a species of *Laurus*, 7 inches long and 2 inches wide, which I have described and named *L. Sprentii*, in honour of Mr. C. Sprent, Deputy Surveyor-

General, whose kindly help in matters relating to the study of the Geology of Tasmania I take this opportunity of gratefully acknowledging. Another form, a species of *Eucalyptus*, is of singular interest, as it is undoubtedly the first fossil indication which I have yet seen in Tasmania of a representative of our existing gum trees, which so peculiarly characterise the existing vegetation of this island. The fossil *Eucalyptus* is very distinct from *E. Pluti* M'Coy, found similarly in Victoria. The Mount Bischoff form I have named *E. Kayseri*, in honour of the discoverer. Many of the plant remains are imperfect, although I can with certainty make out 15 or 16 distinct new species, the greater number of which has been figured by me for this paper.

Figures, in the meantime, for comparative purposes, are the best guides.

There are not sufficient characters to enable me with confidence to refer the most of the forms to known genera, although I have satisfied myself that some of them can with safety be referred to the genera Eucalyptus, Quercus, Laurus, Cycadites, and Ulmus, while others closely approach forms occurring in similar rock under the basalt at Breadalbane and at One Tree Point, which have been referred to the genera Lomatia, Ceratopetalum, and Ficonium, by Baron Von Ettingshausen. The determination of these doubtful forms I intend to submit to Baron Von Ettingshausen and to Baron Sir Ferd. Von Mueller, who have already elaborated a great number of our Fossil Tertiary vegetable remains.

The prevalence of the Oak, Laurel, and Elm, associated with the Gum tree in this tertiary deposit at Mount Bischoff, is of the greatest interest, as it substantiates the opinions advanced by Baron Von Ettingshausen, and mentioned with approval by Baron Sir Ferd. Von Mueller, viz., "that the whole existing vegetation of the world can in its development be traced to an universal flora in bygone geologic ages," and, therefore, such evidence is in perfect accord with the evolution hypothesis. It is, nevertheless, somewhat strange to find that a great number of the prevailing forms in our tertiary deposits (Oak, Birch, Elm, Alder, and Beech), should show a closer alliance to the existing flora of Europe than to the existing flora of Tasmania.

So far as it appears the Tertiary Flora of Tasmania is extremely rich and varied, and its development is worthy of our closest attention.

*Eucalyptus Kayseri*, n.s. Fig. 4.

Leaf lanceolate acuminate, slightly bent, and very attenuate towards the acute apex; base rounded and tapering, about 4¾ inches long and 21 millimetres wide; substance evidently thin;

mid-rib well marked; lateral veins numerous and very delicate, sub-parallel, almost horizontal near mid-rib, the most prominent becoming very indistinct and curving upwards at junction with intra-marginal vein, the least prominent usually anastomising before reaching the same vein; intra-marginal vein delicate, wavy, following moderately close to the edge.

This form is easily distinguished by its most delicate, close, and almost horizontal veins, and by its extremely acuminate apex. Named in honour of Mr. Kayser, the discoverer of many new fossil leaf forms at Mount Bischoff. Found in Tertiary Sandstones, underlying basalt, Mount Bischoff.

*Laurus Sprentii*, n.s. Fig. 1.

Leaf coriaceous, rigid, oblong, about 7 inches long. and 2 inches wide below the middle; base imperfect, but evidently acutely tapering; apex somewhat mucronate; margin simple, very slightly and irregularly-undulating; mid-rib strong; lateral ribs (eight pairs), somewhat thick near mid-rib, first three sub-equal, upper pairs lessening; lateral ribs emerge at an angle of 70 to 80 degrees, gradually becoming extremely fine as they gently curve upwards and outwards towards margin, into which they run at a very acute angle; tertiary veins inconspicuous. From base to 1st secondary vein, 25 mil.; 1st to 2nd, 16 mil.; 2nd to 3rd, 25 mil.; 3rd to 4th, 19 mil; 4th to 5th, 13 mil.; 5th to 6th, 12 mil.; 6th to 7th, 14 mil.; 7th to 8th, 10 mil. Nervules very indistinct, evidently forming a fine oblong reticulation transverse to secondary veins.

*Cycadites microphylla*, n.s. Fig. 8.

Leaf imperfect, simply pinnate; pinnæ, with scarcely visible mid-rib, very minute, flat,linear-subulate, inserted obliquely on the margin of rhacis, at an angle of about 25 degrees, contracted at the base, falcate obtuse or pungent pointed, about 12 millimetres long, and 2 broad at base.

*Quercus Bischoffensis*, n.s. Fig. 5 6.

Leaf ovate-acuminate, ; mid-rib and secondary nerves valid, raised, the latter (about 14 pairs) regular, simple, emerging from mid-rib at an angle of from 45 to 50 degrees, and scarcely curved as they proceed directly upwards and outwards to margin, where each nerve terminates in the sinus or apex of a minute serrature; margin minutely and somewhat irregularly serrated, from two to four serratures between the extremities of secondary nerves. Mature specimens about 5½in. long and 2in. broad.

This handsome form occurs in the greatest abundance in tertiary sandstone of Mount Bischoff. It is distinguished from *Q. drymejoides*, Ettingshausen, which it resembles in some respects, by its more ovate shape and its peculiarly serrated margin.

*Ulmus Tasmanicus*, n.s. Fig. 7.

Leaf ovate-lanceolate; base somewhat imperfect in the only specimen obtained, but evidently rounded; mid-rib strong towards base, and rapidly diminishing towards acuminate apex, where it is extremely delicate though sharply raised; secondary nerves simple or furcate (about 12 pairs) emerging from mid-rib at an angle of about 60 degrees, and proceeding upwards and outwards more or less irregularly straight or curved, terminating in a marginal tooth or serrature; margin somewhat coarsely and irregularly serrate, one or two serratures between extremities of secondary nerves. Viewed from the exposed lower surface of leaf, the left side has the fourth and sixth, and the right side the fifth, seventh, and eighth secondary nerves, furcate: Tertiary nerves at right angles to the secondary rare and very delicate, losing themselves in an extremely fine reticulation.

Length, about 5in.; greatest breadth, about 1¾in.; distance between each of the lowest four secondary nerves at base about 12 milimetres, the spaces gradually lessening upwards. Tertiary Sandstone, Mount Bischoff.

Although it is somewhat hazardous to determine the true position of a plant in the absence of fruit, I have referred the above leaf to the genus *Ulmus*, on account of the very characteristic form and neuration. I have frequently observed winged seed-impressions very like that of the Elm at One Tree Point.

Figs. 2, 3, 9, 10, 11 represent leaf impressions found associated with those described from the Tertiary Sandstones, Mount Bischoff, but whose position is as yet undetermined.

## THE TASMANIAN EARTH TREMORS, 1883-4-5.

BY A. B. BIGGS.

(*Read 9th June*, 1885.)

The minute earth-shocks which have, during the past two years, been adding a new chapter to the history of our island, have been to me from the first a special subject of observation and study. The principal points which I set myself, if possible, to ascertain, were—First.—To arrive at an estimate of the actual magnitude of the surface-motion of the earth; and second.—To gain some idea of the position of the source, or focus, of the disturbance. I soon found, however, that the subject was much more difficult than I anticipated, from (a) the extreme minuteness of the actual earth movement, and (b) the large discrepancies in the reports from different localities, both as to the *time* and the *direction* of the shocks.

I have referred to the *minuteness* of these shocks. As the result of my experiments in the way of measurement I am satisfied that a greatly exaggerated notion of their magnitude generally prevails. To correct this notion, I offer a brief description of some of the apparatus which I have employed in the detection and measurement of the tremors. I at first tried some of the most approved forms of seismometer, amongst others the crossed U tubes of mercury—also a plate of glass, smoked on its upper surface, resting on three marbles, free to roll on a level glass slab. A pin point rested lightly on the smoked surface. This has recorded only once. I also tried a saucer of mercury, covered with a layer of treacle. Of the above, and other forms of apparatus unsuccessfully tried, a fuller description is given in my original MS. in the Society's library. The *negative* evidence furnished by these failures has, however, an important bearing upon the question. The fact that a small wooden style about 3in. in length, stood on one end, reduced to a base of $\frac{1}{10}$in. in diameter, has been overturned by only a few of the strongest shocks, speaks volumes.

It was evident that, for positive results, I must contrive something far more sensitive than the foregoing.

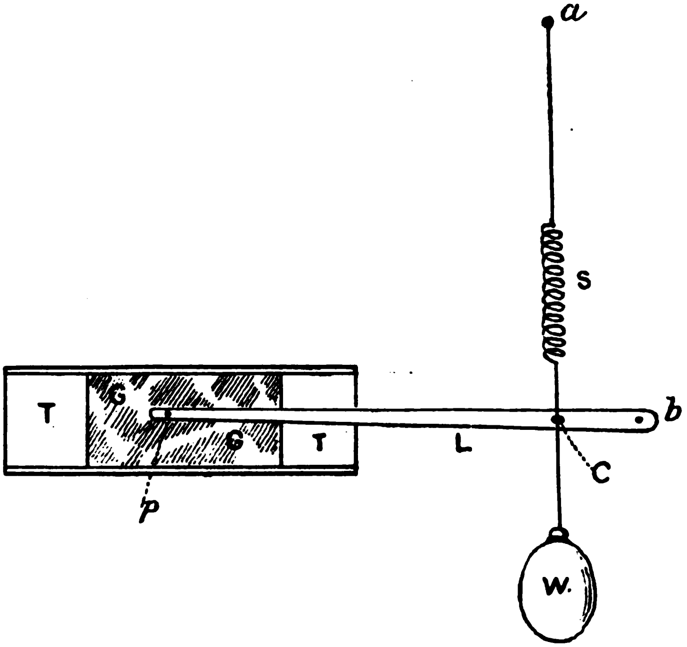
The following apparatus, which I now employ, I have found fairly successful:—

*For Time Signal.*—A free pendulum is suspended by copper wire, the end projecting below the bob and passing through a loop of platinum wire, this loop being only just large enough to allow the pendulum wire to pass through freely, without touching. The loop and pendulum wire each form part of an electric circuit. The least oscillation of the pendulum brings it into contact with the loop, thereby closing the circuit. This rings an electric bell, and at the same instant breaks the current which drives an electric clock, thereby showing the time of shock.

So sensitive is this apparatus, that, although fixed against a solid brick wall, it will respond to a moderate push against the wall with the hand. Of course this is affected only by horizontal movements. The pendulum is about 10in. in length. I at first tried a much longer one, about 7ft. or 8ft., but this seldom acted, in fact only indicated the very strongest tremors.

My signal apparatus for *vertical* earth movement consists of a delicate coiled spring of great elasticity, suspending a small weight through which the spring wire passes, the end

# VERTICAL SEISMOMETER



S........ Coiled spring. suspended at a.
L.......... Lever. pivoted at b. and connected with spring wire at c.
P.......... Pin. through end of lever. the point resting against glass... ..........G.
T.......... Tin slide, turned over at edges for glass (G) to slide in.

mU

of the wire being almost in contact with the surface of mercury contained in a small metallic cup. The least vertical jar brings the lower point of the spring into contact with the mercury, thus completing an electric current and recording the signal. Although I adjust this so that I can scarcely see space between the end of the wire and its reflected image in the mercury, many sensible tremors occur which it fails to register. I find by experiment that the floor of the room near the wall responds to a foot-fall through a space six times that for which the instrument is set as above, the floor being a good solid one; the actual measures of adjustment being ·005in. for tremors, and ·03in. for floor.

I have now to describe what may be more properly designated as my *seismometers*. For *horizontal* earth-movement I have a free pendulum, with a bob of about 4lb. weight. Projecting perpendicularly under the bob is a fine tube, in which slides a pin, point downwards. The point of the pin rests, by its own weight, upon the smoked surface of a piece of glass, which is elevated to the pin by three screws underneath. Any oscillation of the pendulum, or rather of the glass itself (as it is really the tablet, and not the style, that partakes of the earth motion) will of course record itself on the glass. The marks are afterwards measured by micrometer and the direction noted. By far the largest reading of this instrument was recorded on 13th July, last year; namely, 0·28in. (whole oscillation), the next largest being 0·09in. on 7th December, 1883.

My *vertical* seismometer is on the same principle as the electric vertical signal (described before) namely, a weight suspended by a coiled spring. Between the spring and the weight is a horizontal lever, attached at one-fifth of its length from the pivotted end; the free end carrying a pin point which traverses the surface of a piece of smoked glass. The motion is thus multiplied 5 times. The highest reading of this instrument occurred on the same date as that of the other, being 0·15in., on 13th July, 1884. (This to be divided by 5 for actual motion).

The transit instrument should be a most delicate indicator of any permament displacement. I have, from time to time, had to make minute readjustments, necessitated probably by the operation of the tremors. The cause is, however, uncertain, and the indications extremely minute.

The Rev. Canon Brownrigg, by a fortunate chance, obtained an *optical* observation of one of these tremors in the telescope. He was observing a star, when he noticed that the image began to dance in the field of view. He was puzzled as to what had shaken the telescope, until, on going into the house, he learned that a shock had occurred at about the time he was observing. By a necessarily rough judgment, the angular motion as compared with the angular value of the field-bar, would be about 1 minute of arc. This is as if a flag-pole 20ft. in height vibrated through a space of $\frac{1}{14}$in. at the top.

Now, in apparent opposition to the conclusion to be drawn from the foregoing as to the minuteness of the shocks, we have certain well avouched facts. I first take the somewhat startling circumstance reported in the Launceston papers by Mr. Geo. T. Hudson, as observed by him during the strong tremor of 13th December, 1883. He says:—"Our attention was directed particularly to the mud-flat" (in the river) . . . "which was a state of rapid agitation, moving apparently up and down in a most remarkable and alarming manner, the motion apparently coming from beneath, and from N.W. to. S.E. The rapid motion continued for fully one minute, and then gradually lessened, until it finally ceased. The wave motion was exceedingly severe, the tide being very low, etc." It is not surprising that such a sight as this should impress the beholder with the idea that it must be caused by some very violent agitation. I think, however, that it may be explained without any such inference. The tide was low, the mud-flat was still wet and glistening, and of course it reflected vividly the rays of sunlight. Under these circumstances the smallest motion of the surface would be immensely magnified, the magnification increasing with the distance from which it was viewed, in addition to the fact that the deviation of the reflected ray would be doubled by reflection. On this very occasion I was with a party taking tea, in a summer-house in a garden almost adjoining the spot from which Mr. Hudson viewed the phenomenon, and yet the tremor passed totally unperceived by any of us.

The shake of 13th July, 1884, was unquestionably by far the greatest shock of the whole series, and the only one that I know of that furnished any permanent and unquestionable exhibition of its violence. The principal tokens it left behind, in Launceston, were the throwing down a finial from the top of one of St. Andrew's Church spires, and the displacement of the masonry of another by about an inch, the throwing down of the newly-erected chimney of a bakery, also the top brick or tile of the chimney of Mr. Lay's house. All these effects however, may, I think, be accounted for without supposing anything more than a very minute shaking. (See M.S.)

On the day following, I visited some of the china and glass warehouses, where I saw goods so piled that I should have thought that merely walking heavily across the shop would cause a smash; yet I was told that nothing had been disturbed. In fact, I was informed at Mr. Hubbard's establishment, that the rumbling of the carts along the street caused more commotion amongst the crockery than the generality of the tremors.

I have dwelt at considerable length upon this branch of the subject, namely, the extreme actual minuteness of the earth-movement, because I have to combat an almost universal impression that is directly opposed to my deductions. The question will naturally arise—How are we to account for this impression? I am inclined to think these tremors are *vibrational*—our nerve-system is peculiarly sensitive to vibrations. The vibration of a great organ pipe may be felt as well as heard. A tap with a walking stick upon the end of a 20ft. log will be distinctly felt by a person sitting on the other end. I have, while reclining on a spring sofa, felt the vibration from a passing cart during its passage along the whole length of the block.

Mr. Jackson, machinist, of Patterson-street, Launceston, informs me that he spent some years in Japan, having left only recently, where he was employed mechanically in the construction of Mr. Milne's successful seismometers. He assures me that our tremors are very insignificant in comparison with those prevalent in Japan, our strongest shocks only being comparable to their weak ones.

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With regard to the *position of the focus,* I assumed that there were two modes of arriving at a solution of the question, the one being a careful analysis of *the lines of direction,* and the other a *comparison of the times* at which the shock was felt in different localities. The first method, however, was found to fail in practice, probably owing chiefly to the fact that the molecular motion of a body in vibration is distinct and different from the actual wave progression. The second mode was rendered difficult and uncertain by the fact that the time quotations were evidently in many cases inaccurate and inconsistent.

Undoubtedly the tremor of 13th July, last year was, as I have said, by far the greatest of the series, and, from the wide range over which it was felt, was the first to furnish sufficient data from which to form anything like an approximate estimate of the position of its focus. I made a very careful analysis of the time records of this wave, which was published in the *Launceston Examiner* of 22nd July. The principle which I applied to this investigation I more particularly specified in a subsequent communication to the same paper, dated September 2, 1884, as follows:—I assumed that the earth-wave," should progress in a more or less irregular expanding circle, having the focus of disturbance in the centre; consequently there should be points situated all round the circle where the tremor should be felt at the same instant, just as a ripple from a stone thrown into a pond progresses all round from the centre outwards." Of course, difference of conductivity in different strata would tend to distort, more or less, the supposed circle; still, over long distances, I think we may fairly assume a pretty nearly equal average in different directions.

In applying this principle, it was necessary to first "smooth" the time curves, by averaging the different time reports from contiguous localities (I had 54 to work upon). I now quote from the article referred to (22 July):—

"It would appear that the wave first struck the coast line of N.S. Wales, from Sydney to Eden, nearly simultaneously, at 2 p.m. (1·44 p.m. our time). It next reaches Ringarooma at 1·55. A nearly synchronous line next passes through Wilson's Promontory, George Town, Launceston, Midland, Hobart, and the Huon, at 1·57. Lastly, it reaches Bischoff at 2·1. Now, the nearest focus I can find for these synchronous curves is about the East Coast of New Zealand. Setting one leg of a pair of compasses upon Mount Egmont, the other leg would strike these curves with considerable accuracy. These curves are separated by a distance of about 260 miles (roughly) from inner to outer. An earthwave has been estimated to travel at from 1200 to 1300 miles per hour. The shock reached Sydney 17 minutes before it reached Bischoff. This, at 20 miles per minute, would give 340 miles. But I think we have good reason for estimating the progress of the wave at a much slower rate, inasmuch as nearly all reports agree in describing the sound as *preceding* the shock, showing that the earth wave was slower than the sound wave. Taking this circumstance into account, I think the time taken in passing from curve to curve is not inconsistent with the foregoing hypothesis."

In this analysis I am, of course, not responsible for the correctness of the data, only for the conclusions deduced therefrom.

Next in importance, both as to strength of shock, and also with regard to the area over which it is traceable with reasonable precision, is that of 19th September last. Applying the same principles of investigation as before, it would appear that this wave first reached the N. East Coast at about 8·30 p.m.; then Launceston at 8·37½; Longford, Corners, Campbell Town, and Ross, at 8·38; and Prahran and Cape Schanck, at 8·39 (our time). A synchronous curve of 8·39 would pass through Prahran, Cape Schanck, and George Town,—a little west of Launceston, by Campbell Town, and somewhat east of Hobart. The focus of such a curve would be about 500 miles east of Cape Howe. (See my notes, *Launceston Examiner*, 2nd October).

So far then as the time record of these two great shocks may be relied on, they agree in indicating a focus far away to the eastward, and that the supposition that *these* emanated from anywhere near the Straits Islands is quite untenable.

Although, as I think, the conclusion at which I have arrived with reference to these particular shocks is inevitable from their time record, I by no means contend for a general application of that conclusion to the whole series. I have long felt a strong leaning to the probability that the home of a great proportion of these shocks is somewhere in the vicinity of the N.E. of Tasmania. But I am inclined to think it not only possible, but even probable, *that they do not necessarily spring from any one point in particular.* It is noteworthy that indications of direction have been extremely varied and perplexing. For some time after the commencement of these tremors, the prevailing direction appeared to be from somewhere near North-West, suggesting Sunda as their source. The time record, especially from August to the beginning of December, 1883, showed a prevailing progression towards the East and South, the shocks most frequently reaching Launceston before the East Coast and Hobart. Then there appeared a general change of direction, and from about April or May, 1884, as a general rule, they struck the N.E. Coast first. In my published meteorological remarks for May, 1884, I wrote as follows :—" I have observed during the past two or three months a marked change in the character of these tremors, inasmuch as they now appear to proceed from no direction in particular, and frequently give indications of a *twisting* motion." This would appear to indicate the transition stage.

Mr. Arthur Green, from whom I have received valuable assistance, has an ingenious and effective little pendulum seismometer, whose indications were frequently confirmatory of the above-mentioned peculiarity of motion. Its tracings about the time mentioned above often exhibited a more or less circular figure, as if actuated by simultaneous transverse forces. The shock of 21st March last exhibited a somewhat similar characteristic. My seismometer (horizontal) record was a circular mark of about $\frac{1}{20}$ inch diameter, which a magnifier showed to be crossed and re-crossed in all directions.

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On the question as to the origin of these tremors, it appears to me that three hypotheses present themselves for consideration :—

1. The operation of *local volcanic* forces—that is, that the source is under our feet.

2. The *vibrations from some distant centre,* or centres, of volcanic activity.

3. Minor forces, comparatively local, excited into *sympathetic activity,* by some distant or general disturbance.

The first of these, I think, we may dismiss. As I remarked in discussing the 13th July tremor, "immediately over the focus of the disturbance the motion would be *vertical,* the earth-wave becoming more and more inclined as it recedes from that point.

Now, my seismometer readings indicate *great inclination,* or very minute vertical motion in comparison with the horizontal. This has been the general indication of my seismometers.

The *second* hypothesis is rather favoured by the records of the great shocks 13th July, and 19th September; but, against that, we have no knowledge of any sudden or violent convulsion in the direction indicated. Still, that there are forces at work in that direction is evidenced by the boiling springs, as well as at least one active volcano in New Zealand. It is, I think, not improbable that deep subterranean action of no great violence might propagate its vibrations to a long distance.

The *third* hypothesis fits in with the fact, which should not be overlooked, that during the whole period of these tremors, the entire globe has been in a state of abnormal disquiet. Within the period, there have been terrible earthquakes at Ischia and Sunda, besides lesser in Persia, Asia Minor, Spain, England and other places; also numerous volcanoes abnormally active, and new ones breaking out in all directions from Iceland and Alaska northwards, to New Zealand at least southwards. (Those at the extreme south we do not know about.) If the origin of our tremors were some fixed centre, I think we should not have had so much trouble in determining its position. After making all allowance for errors in time, I think the indications go to show that the minor tremors at least proceed from various directions. This again favours the third hypothesis.

If we might admit the probability of our being affected by shocks from the antipodes, it would almost seem as if our tremors had some indirect connection with earthquakes that have occurred the other side of the world. For comparison, I give below the dates of earthquakes in other places, with the nearest period of special activity in Tasmania:—

On 28th July, 1883, occurred the earthquake of *Naples,* and on 30th we had several tremors during the day, some of them felt generally throughout the island.

On the 26th August was the outbreak at *Sunda.*

We had an increase on 28th, culminating on 30th.

October 19th.—*Asia Minor.* Maximum in Tasmania on 26th, 27th, 28th. (Nothing very special.)

December 22.—Severe shock at *Lisbon.* 24th.—Launceston (several tremors), and New Zealand.

February 10, 1884.—*Asiatic Turkey* (severe). *Tasmania,* for several consecutive days, both before and after, culminating in a violent one on the 14th, with several minor shocks same day.

April 22.— *England.* Tasmania, all through the month; strong ones on 12th, 14th, 24th, 25th, and 26th ; and on 27th my electric signal was going repeatedly, almost continuously.

May 19.—*Persia.*— Severe. Tasmania.—Repeated and almost continuous signals on 21st, 22nd, and 23rd.

January 26, 1885.—*Alhama* (Spain).—"Severe." "Tremendous report. One person killed."

27, 28.—*Southern Syria.*

27.—*Valparaiso* (morning).—Severe and long.

31.—*Algiers.*—Eight houses destroyed.

30-31.—*Tasmania* (midnight).—Strong, after a month or more of comparative quietness.

It will be seen by the foregoing list that a considerable interval elapses between the earthquakes elsewhere and their apparent effect upon us, far too long to admit of the supposition that it is the *direct* wave that reaches us. But may we not reasonably conceivè of intermediate sources of energy (whatever may be their nature, for I am not going to commit myself to any volcanic theory in particular) which require only the slightest jar to disturb into operation, such, for instance, as fissures ready to collapse, or internal reservoirs of water, or gases, just ready to burst their bounds? I simply throw out these suggestions for what they are worth; I will not presume to dogmatise.

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From the circumstance that very few of these shakings are felt down in the mines, the opinion has been pretty widely entertained, that they are merely superficial. I cannot accept this inference. In the mines the men are engaged about their work on solid ground with nothing but solid rock or earth around them—nothing to clatter or shake, or to give any indication of slight movement. On the contrary, above ground we are probably comfortably reclining, in the quiet of evening (when a great proportion of these tremors are noticed) perhaps on a spring sofa, in a more or less shaky tenement, and surrounded with glassware and nick-nacks that vibrate and respond to the slightest motion. No wonder, therefore, that minute shakings, totally unperceived by workers underground, are obstrusively apparent to us.

It has been observed that earth-shocks have frequently been associated with sudden and sometimes violent barometrical disturbance, from which I have been led to examine our own barometrical readings in connection with our periods of special telluric disturbance. I have failed however to discover any relationship between them. These periods appear to be associated indifferently with high or low, rising or falling barometer.

I have on my notes several other points which I believe would have been of interest, but I must forego them, as I fear this paper will be deemed too long already.

I would take this opportunity of thanking my numerous correspondents, who have from time to time assisted me by their communications.

## NOTES ON JEAN JULIEN HOUTEN DE LaBILLARDIERE.

By Baron F. Von Mueller, K.C.M.G.

(*Read* 14*th July*, 1885.)

Jean Julien Houton de LaBillardiere, born in Alençon (Orne), 28th October, 1755; died in Paris, 8th January, 1834. He graduated in medicine in the University of Montpellier, but subsequently devoted his studies almost exclusively to botany. For this purpose he traversed first the European Alps, and travelled, then, through some portion of Britain. In 1786 and 1788 he was sent by Louis XVI. on a botanic exploration of Syria, which brought him also to the Lebanon. The literary result of this journey was his work, "Icones plantarum Syriæ rariores," the first part of which appeared in 1791. When in 1792 the first search expedition was sent out under Admiral d'Entrecasteaux to ascertain the fate of Count La Pérouse and his crew, M. de LaBillardiere became botanist of the expedition, and had thus the splendid opportunity of rendering known much of the vast vegetation of South-west Australia (King George's Sound having only in the year before been discovered by Captain Vancouver), and also of the southern part of Tasmania, he being the first to explore phytologially the region where now the town of Hobart stands, although Bruni Island was visited during Cook's second and third expeditions in 1773 and 1777 already. At the war time LaBillardiere's collections were confiscated in Java; but on his return to France were restored to him through the influence of Sir Joseph

Banks, an act of generosity on which particular stress was laid in the necrology of Banks in the French Academy. The results of LaBillardiere's researches during D' Entrecasteaux's expedition are largely contained in the two folio volumes, "Novae Hollandiæ plantarum specimen," 1804-6; in the "Relation du voyage a la recherche de La Perouse," 1799, of which soon subsequently an English translation appeared. Further, in the illustrated quarto publication, "Sextum Austro-Caledonium" (1824-5), his three weeks' stay in New Caledonia during D'Entrecasteaux's voyage affording La Billardiere the opportunity to shed almost the first scientific light on the largely endemic vegetation of that island, but very little having been elucidated of that flora by the two Forsters previously.

Sir James Smith having already, in 1793, dedicated the genus Billardiere to the botanical companion of D'Entrecasteaux, it being founded on the widely distributed south-east Australian Billardiere scandens, to which, curiously enough, LaBillardiere was able to add in Tasmania the graceful and elegant B. longi flora De Candolle, described a third in 1824, Bentham a fourth in 1863, while in late years four species more were added to the genus by myself. (See Census of Australian plants, p. 7.) It seems, however, not likely that the genus will receive further additions to its eight now known species.

# DESCRIPTION OF TWO NEW SPECIES OF TERTIARY FOSSIL PLANTS BELONGING TO THE GENERA *EUCALYPTUS* and *TAXITES*.

By Robert M. Johnston, F.L.S.

[*Read August* 10, 1885.]

Among a very interesting collection of Fossil Plants, now in the Royal Society's Museum, I have discovered a new species of Eucalyptus. This collection contains numerous impressions of leaves belonging to the genera Laurus, Cinnamomum, Fagus, Magnolia, and others more difficult to determine. The general character of these remains (at one time carefully numbered) as well as the species *Cinnamomum polymorphoides*, McCoy indicate that they probably belong to the same horizon as the lower zone of the Launceston Tertiary Basin.

The locality whence they were obtained, however, is not known to me, although I had made enquiries of the late Messrs. R. Gunn, and Roblin, and also of Mr. T. Stephens, and others who might be expected to throw light upon the matter. I am inclined to the opinion that they were collected by the late Dr. Milligan from the Tertiary Leaf Beds at Macquarie Harbour. A fresh collection from this place might satisfactorily set this doubt at rest.

The species of *Taxites* with fragmentary coniferous and other plant impressions, too imperfect for determination, was kindly forwarded to me by G. Thureau, F.G.S., Inspector of Mines, who collected them in clayey beds underlying and intercalated between the basalt sheets at Mount Bischoff. Mr. Thureau states that these clays overlie and are intimately associated with the tin drift deposits at this place, and he thinks that the clay sediments were derived from the volcanic tuffs and other ejecta.

The species of Eucalyptus I have named in honour of Dr. Milligan, who was the first local worker in Tasmania who contributed largely to our knowledge of Tasmanian geology. The species of Taxites I have named in honour of Mr. Thureau, who has afforded us, in his many official reports, much valuable information regarding the mineralogy and stratigraphy of the important mining localities.

The following is a description of the species referred to :—

Taxites. *Brogniart.*

Leaves linear, narrow, or sub-falcate, obtuse, coriaceous, fleshy, with a median rib ending in a minute mucrone, flat, furnished with a half twisted pedicel which is briefly decurrent.

*Taxites Thureaui*, nov. sp.

Branchlets narrow, leaflets numerous, linear, somewhat falcate, alternate, bilaterally and closely disposed, emerging from the axis of branchlet at an acute angle; extremites pointed and slightly incurved; decurrent pedicels nearly as broad as leaves, and forming an imbricated appearance along the axis of branchlets which is very fine; branchlets terminating in imbricated broad scaly heads, probably containing the fruit. Leaflet 2 millimetres long. Breadth across branchlet measuring from tip to tip of bilateral leaflets 10 millimetres.

Locality—Tertiary leaf Beds, Mount Bischoff.

*Eucalyptus Milligani*, nov. sp.

Leaves ovate-lanceolate or lanceolate, mucronate acute, with very numerous fine transverse parallel veins, the intramarginal one scarcely distant from the edge. The lateral parallel veins emerge and radiate gently outwards and upwards. This species more closely approaches the existing *Eucalyptus ficifolia* of Western Australia than to existing species in Tasmania, or to the described fossil species *E. Kayseri*, mihi, and *E. Pluti* M'Coy. Large specimens 9 inches long when perfect, and 2⅝ inches broad at greatest diameter.

Supposed locality—Tertiary Leaf Beds, Macquarie Harbour.

# MOSS FLOWERS, SPLIT-MOSS, BOG-MOSS, AND EARTH-MOSS.

By R. A. Bastow,

[*Read August* 10, 1885.]

## Moss Flowers.

In a paper on Mosses, read before this Society on the 12th of last May, the more easily distinguished generic characters of that natural order were described, and amongst them the peristomes or fringes of teeth surrounding the mouths of the fruit capsules, which deck their summits as with jewelled crowns. The inflorescence of these tiny plants was not referred to at that time; nevertheless, a brief description thereof is essential to the study of bryology, and it may interest the Fellows of the Royal Society.

The male inflorescence consists of *antheridia*, minute oblong bodies intermixed with a number of jointed filaments, or *paraphyses*. These are enclosed by leaves, and altogether form a small bud-like flower (*flos gemmaceus, Mitt.*), or they are sometimes surrounded by short spreading leaves, and, consequently, with the antheridia visible from above (*flos discoideus, Mitt.*). Some species of these latter flowers cannot fail to attract the attention of the most casual observer, appearing, as they do, to the unassisted vision, even at the distance of two or three yards, as glittering green or reddish stars dotted about on the darker green velvety masses of moss that cushion the moist and clayey bank.

The female inflorescence consists of *archegonia*, small bodies of an oblong form and swollen at the base. Individually, they are not unlike a flask in appearance, the upper portion or neck being in some respects analogous to the style and stigma in a phanerogamous plant. These are also mixed with jointed filaments or paraphyses, and in some species they may be found with antheridia in the same flower, they are then *synoicous*.

In order to minutely examine the antheridia and archegonia, they should be denuded of the perigonal leaves as closely as possible by means of a pair of a tweezers; they may then be laid on a glass slide with a drop of water and be finely divided with a sharp knife, they should afterwards be spread out a little with a needle point and be covered with a thin covering class. They should first be examined with a half-inch objective, and again with an eighth of an inch objective.

The archegonia never develope into fruit unless they are in the neighbourhood of antheridia, any botanist paying attention to the growth of mosses will be able to produce instances to prove that dioicous mosses (mosses that have the male and female inflorescence on separate plants), in whose neighbourhood no male plants of the same species occur, produce perfect archegonia, but never fruit. Fertilization must take place before fruit can be developed. The contents of the antheridia being probably of vital importance to the commencement of growth of the *germen* in the archegonia, they become interesting objects for investigation with the microscope. When thus examined it is observed that as the antheridia become ripe they open at the upper extremity, and from thence flows a granular substance composed of innumerable cells. If one of these cells is closely examined, an antherozoid will be observed coiled up in its centre; each of the innumerable cells contain each an antherozoid, these become free in a short time and roll about the field of vision by means of cilia, sometimes for three or four hours. Similar moving bodies may be observed in the paraphyses.

Unger, Pritchard, Griffiths, Mitten, Hofmeister, and others have borne testimony in their several works to this singular phenomenon. Hofmeister, in his work on the Higher Cryptogams, p. 156, says: "I have not succeeded in finding spermatozoa (antherozoids) in the central cell of the archegonium of mosses, near the germinal vesicle as I have in ferns. I have, however, seen in Funaria, a moving spermatozoon, which has penetrated through the third part of the length of the neck of an archegonium which was ready for impregnation."

When the archegonium has been fertilised, the interior seed-vessel rapidly advances in growth, and the young seta, or fruit stalk, may be seen to be developed at the base, its summit gradually forcing the seed-vessel upwards. As the young capsule rises, the strain on the outer coating of the archegonium is so great as to rupture it transversely, the upper part adhering to the young capsule in its ascension, and forming the beautiful object known as the veil or calyptra which adorns the ripe capsule.

In thus briefly glancing at their life history, how strange it is that this lovely though lowly order of plants should produce, shall we say animalculæ, and that when, by insects or by the gentle breeze, these are carried to the ripe archegonia, each organism should develope into, not one, but a multitude of eggs or spores, and each egg or spore, under favourable conditions, capable of developing into a perfect plant. The note which the Poet Laureate strikes, elicits a sympathetic vibration as he pens in song :—

> " Flower in the crannied wall,
> I pluck you out of the crannies ;
> Hold you here in my hand,
> Little flower, root and all.
> And if I could understand
> What you are, roots and all, and all in all,
> I should know what God and man is."

### SUB-ORDER 1. ANDREÆACEÆ. Split Mosses.

### Genus 1. Andreæa.

The golden margined and black-brown centred tuft of Andreæa, the only genus in the sub-order Andreæaceæ, affects not " the mossy fountains sedgy side," nor yet " the limpid bubbling rill," disdainful of such poetic corners, it aspires to great altitudes, and finding a congenial home on the face of the ancient storm-worn escarpment, there it luxuriates and attains perfection. Bridel, in his "Muscologia Universa," informs us that is found on the Alps at the line of perpetual snow, and that it is rarely found on low elevations or on plains. Mitten, in the 12th Vol. of the Journal of the Linneæn Society, defines its habitat at an elevation of from 11,000 to 14,000 feet above the sea for the continent of South America ; and Hobkirk, in his Synopsis of British Mosses, places it at Alpine and sub-Alpine heights. It has, however, been obtained within one mile of Hobart, and R. M. Johnston, Esq., has observed it near the sea level on the northern shores of Tasmania.

If we proceed along the quarry road which skirts the southern base of Knocklofty, the first great moss-covered and lime-stained crags that arrest our attention on the right, are clothed in parts with fruited tufts of this genus. These, with Bartramia and Frullania, give richly varied tints to the face of the cliff.

This singular genus is the connecting link of the two natural orders Musci and Hepaticæ, and is therefore very interesting. The capsule is small and erect, and bursts by four or more vertical slits when it is ripe. In this character it closely resembles a Jungermannia, but in other respects it is truly a moss.

There are only five species described in Flora Tasmaniæ as native of this Island, and the number has not been increased in Mitten's recent catalogue of Australian mosses ; but it is highly probable that other species will be found on the slopes of our lofty ranges. The beautiful Andreæa Wilsoni may yet be discovered for Tasmania, and this would indeed be a reward for all the fatigue endured by the young botanist in search of new species.

### SUB-ORDER 2. SPHAGNACEÆ. Bog Mosses.

### Genus 2. Sphagnum.

The name of this genus, the only genus in the Sub-order, was used by Pliny to designate the lemon-coloured tufts of Usnea (Lichen) that mantled the trunks and branches of trees in Italian forests, a growth by no means unfamiliar to us in Tasmania at the present day. According to Bridel, Dillenius first gave this name to the bog mosses, and Linneæus and Hedwig perpetuated it. Sphagnum may be found all the world over; in Lapland, the careful mother gathers and weaves the snowy tufts into a comfortable bed for her baby, it is so soft and spongy, so beautiful and pure, and when lined with eider down as it often is, it is a comfortable and cosy nest for the as yet unhardened inhabitant of that bitterly cold country.

The Sphagnum bogs cover extensive areas in Great Britain, and one of the greatest difficulties that George Stephenson had to encounter in making the Lancashire and Yorkshire Railway was the great bog known as Chat Moss. The Sphagnum plants in that bog reach down to an enormous depth.

When the Sphagnum bog becomes filled up and consolidated it forms peat, a substance as useful to the Skye-crofter or to the isolated inhabitants of England, Ireland, and Wales as wood or coal is to the Hobartian.

In the economy of nature the Sphagnum bog plays no unimportant part; the waterlogged depression is its home, there it luxuriates and multiplies, levying new substance from the surrounding light and air; the depression in the fulness of time becomes filled up, and in its turn is ready to yield to the husbandman produce for his toil. There are seven species of this genus described in Flora Tasmaniæ; to these may be added other two species, viz: S. Novæ Zealandiæ (Mitten), from Mitten's recent catalogue, and S. Moss-manianum (C. Muller). A specimen of this last may be seen in Mr. Archer's collection of mosses in the Royal Society's possession. Patches of this moss may be found at the top of Mount Wellington and near the Springs. Mr. Abbott, of the Royal Society's gardens obtains large quantities near Brown's River; it is so plentiful there that the carts back into the bogs almost to the depths of the wheels, and the sphagnum is forked into the cart as though it were hay, it is then sent away to fulfil some useful purpose.

The species are distinguished by the thickness of the cortical layer surrounding the stem; this is in some species constituted of five layers of cells, in others of three layers, and in yet others of one layer only. This specific character, in conjunction with the form of the leaf, is sufficient to identify the few species as yet known in Tasmania. The capsule is nearly globose and is sessile on the seta or fruit stalk, and the mouth of the capsule is destitute of peristome or teeth. It is, notwithstanding, an elegant form, and can be easily examined with a pocket lens. The leaves are remarkable for their singular cellular structure, and each cell contains a formation which Robert M. Stark in his "British Mosses" designates "a spiral fibre."

### SUB-ORDER 3. BRYACEÆ.

### *Section* 1. *Fruit terminal.*

Tribe 1. PHASCÆ. Earth Mosses.—Genus 3.—Phascum. The plants of this genus are the smallest of all mosses, and probably the smallest of all flowering plants, some of the species not exceeding the size of an ordinary pin's head, roots, stem, leaves, and fruit included. All are perfect after their kind, and as varied and beautiful as flowering plants of larger growth and more easily observed.

These tiny plants must be looked for on the beds of dried up pools and on clayey or chalky banks; it will even be necessary to kneel down with pocket lens in hand and carefully examine the surface of the soil to detect the presence of some species. The capsule of Phascum bursts irregularly when ripe, and in this character it differs from all other mosses. The brightly coloured capsule, the intensely green leaves, the flowers, and the marked cellular structure combine to make this plant an interesting object for dark ground illumination with the microscope, one which may justly lead us to reflect on the mystic *Vital Force,* that of one primordial cell, developes, in its own peculiar way, and by two generations, into a minute but perfect Phascum plant; and of another to all appearance exactly similar cell, in its own peculiar but very diverse way, into a giant Pine or Eucalyptus.

# DESCRIPTION OF TWO APPARENTLY NEW SPECIES OF GENUS ANCILLARIA. *LAM.*

By W. F. Petterd, C.M.Z.S.

[*Read September* 7, 1885.]

**Ancillaria Fusiformis**, n. sp. Shell fusiform, somewhat thin, white to pale chestnut, shining; spire produced milky-white with thin layer of callous, spirally striated above and below the suture, which is margined below with a broad zone of the same appearance, bounded with a distinct spiral line; base of body-whorl milky-white, bilined; columella thinly callous, extending on to body-whorl, obliquely striated at base; aperture elongately ovate; outer lip thin.

Long. 20; lat. 9 mil. Apert. long. 10; lat. 4 mil.

Habitat.—Swan Island, Bass' Straits.

This shell is much smaller and more fusiform than its nearest ally *A. Marginata Lam* or its *var. Tasmanica T. Woods*; it also differs in colour and general structure. So far I have only obtained it from the locality given, but in all probability its range extends to the other islands in the vicinity or even to the mainland. The examples are not in very good condition, but quite sufficient to show its distinct specific characters from the more widely distributed and abundant form. Like the *olives*, all the species are much of the same structure, but, unlike that genus, they are very constant in specific characters.

**Ancillaria Obtusa**, n. sp. Shell ovate, thick, shining, white to pale fulvous; whorls about 5; spire short, rounded, lined, covered with a thick callous deposit, apex obtuse, blunt; body-whorl margined above and below with a broad milky zone, and lined at the base; columella with a thick layer of enamel extending on to the body-whorl, perceptibly wrinkled and twisted at the canal; outer lip thin, acute.

Long. 17; lat. 8 mil. Apert. long. 10½; lat. 4 mil.

Habitat.—North-West Coast.

This is comparatively a small stout form, with a short swollen and rounded spire, caused by its rather thick deposit of enamel. It is very distinct from the preceding specie, and equally constant in form, colour, and general structure. I submitted examples to Professor Tate's critical examination, and his opinion is that it is quite separate from our other species. From its small size it has probably been passed over as a stunted *var.* of *A. marginata.* Like many of our more recently discovered species it appears to be local in habitat, although not by any means rare, in favourable localities, between Tamar Heads and Table Cape.

# ENERAL OBSERVATIONS REGARDING THE CLASSIFICATION OF THE UPPER PALÆOZOIC AND MESOZOIC ROCKS OF TASMANIA, TOGETHER WITH A FULL DESCRIPTION OF ALL THE KNOWN TASMANIAN COAL PLANTS, INCLUDING A CONSIDERABLE NUMBER OF NEW SPECIES.

BY ROBT. M. JOHNSTON, F.L.S., ETC.

[*Read September 9th*, 1885.]

## CARBONIFEROUS SYSTEM (Up. Pal.)

By common consent the name given to this system, in Europe especially, applies to a vast series of rocks, well represented in every division of the globe, composed principally of alternating beds of sandstone, shale, fireclay, ironstone, coal, and limestone. In Europe and America the beds of the system pass insensibly into the underlying Devonian, although its principal members are most markedly distinguished from the latter by its peculiarly rich and characteristic vegetable deposits. It is to this profusion of vegetable remains that the system owes its name. Although in Europe the upper limits of the Carboniferous system can, with some degree of satisfaction, be separated from the lower limits of the succeeding system, known as the Permian, or Dyas, which according to artificial classification is deemed to close the Palæozoic age, it is not as yet always possible in other countries, especially in Australasia, to find special stratigraphic or organic characters, whereby the divisions between the two periods can even be most distantly approximated. The two systems for the purposes of this paper are therefore grouped as one under the term *Carboniferous system*.

The difficulties of any attempt to define the equivalents of the Carboniferous and Permian systems in Australasia may perhaps be unfelt or overlooked to a great extent by many Palæontologists, whose observations are often based upon collections made in the field by other hands, but it is otherwise with the field geologist, who must needs correlate locally stratigraphy with palæontology, and therefore cannot so easily ignore the evidences of the former when dealing with the latter. The field worker, therefore, finds much greater difficulty than the Palæontologist, as such, in any attempt to break into minor systematic sub-divisions, the various formations of any local group which seem to run insensibly into each other. Divisions of systems are, at the best, artificial and imaginary as regards the whole succession of rocks on the earth's surface—a fact which is too often overlooked—and they are only of local value where the breaks or limits of characteristic life and stratigraphical connection can be seen to coincide.

Conclusions from Palæontology, based upon the association of typical organisms with typical rocks in one part of the earths surface, certainly form a strong presumption in favour of their application in a distant part of the earth where such combined associations seem to harmonise, and no doubt in a large measure this holds good, but they are also apt, by force of preconception, to mislead the Palæontologist where the evidences of Stratigraphy are obscure or in conflict. Nothing has so strongly demonstrated the value of Jukes' cautions as a field geologist, in the consideration of such matters, as the discovery of the existence in Australia of a land flora of European Mesozoic aspect, interstratified with a marine fauna of a distinctly marked European Palæozoic facies. It is not without advantage that mistakes were made by Palæontologists over this question, for it has profitably warned us that, in all such matters, we are too apt to crystalise opinion; to fall back upon an old locally useful generalisation, rather than be at the trouble to readjust the true relations of fresh facts and fresh combinations in areas far removed from the centre where the first generalisation was formed, and where, probably, it still holds good. Much unnecessary warmth of controversy between able and well-informed authorities might have been obviated hitherto if questions regarding centres of origin had received due attention in a broad and philosophical spirit when discussing the new facts and relations in Stratigraphy and Palæontology, which at first sight seemed to be evidences of "conflicting testimonies of the rocks." It cannot be too frequently asserted that the associated facts of stratigraphic and organic relation in one part of the world can never be severed or successfully subordinated by generalisations or deductions, however skilfully made, from dissimiliarly associated facts or relation in another distant part of the world; and it is this conviction, enforced by the difficulties of local experience in the investigation of Tasmanian geology, extending now over a period of 15 years, which induces me to concur with Mr. Jukes (p. 22, "Sketch of the Physical Structure of Australia, 1850") in the statement that, before we can rest satisfied with "existing classification of the rocks of Carboniferous, Permian, or Mesozoic age, we must study more thoroughly many questions, such as the original centre of production of the animals (or plants), and the time necessary for their migration and general spreading over the globe. Whether they might not have become extinct at the spot where they first began to exist before they could spread in vast numbers over the opposite hemisphere."

"Questions like these have yet to be answered before we can determine whether or no strict synchronism (or homotaxial relation for that matter) can be deduced from the fact of the fossils in opposite hemispheres being representative of, or even, if it turns out so, identical with each other. At all events, we must not trust too implicitly to single or isolated facts. We must get the series of formations in each case and compare them with each other, and endeavour to trace out some common starting point of time before we shall be able to draw clear geological horizons, establish definite chronological epochs common to the whole earth."

With these observations of so thoughtful a geologist as the late Mr. Jukes I am still in complete accord, notwithstanding the valuable contributions made to our knowledge since that time by the combined labours of men of such genius and skill as McCoy, De Koninck, Ettingshausen, Müeller, Feistmantel, Tenison-Woods, Tate, R. Etheridge, jun., and many more.

It does not follow that because Glossopteris and other fossil genera of Mesozoic facies have been demonstrated (by W. B. Clark, Daintree, Feistmantel, and other authorites) to have their beginning in Australasia in the Palæozoic age, that these alone are to be regarded as having made their appearance in Australasian rocks anterior to their appearance in India and Europe. From evidences available there is a presumption that other typical genera may also have appeared in Australasian rocks anterior to the period, in which they or their congeners make their appearance in the rocks of countries widely separated from Australia; and hence we cannot as yet confidently accept classifications recently proposed by some authors who divide with too much artificial precision many closely related formations in Australasia whose stratigraphic relationships are still too obscure or uncertain to warrant the finer subdivisions of the Palæontologist. Palæontology divorced from facts of local Stratigraphy is unsatisfactory. Huxley forcibly observes ("Lay Sermons," p. 234) "There seems, then, no escape from the admission that neither Physical Geology nor Palæontology possesses any method by which the absolute synchronism of two strata can be demonstrated. All that Geology can prove is *local order of succession*." It cannot be overlooked also that the materials upon which the Palæontologist works are often deceptive and unsatisfactory. There is not the connection between essential parts of classification nor the means of frequent verification, as in the study of living plants and animals, which also has its difficulties, and hence it too frequently happens that a great number of the generic and specific creations of Palæontologists are of necessity artificial, as they are formed upon trivial characters which, on fuller knowledge regarding fruit and other essentials, may to a large extent prove to be individual variation rather than distinctly specific. Professor W. C. Williamson, in his opening address to the Geological Section of the British Association at Southport, in 1883, has strongly commented upon dangers to true and natural classification from this source. In his remarks, under the section FERNS, he states (see p. 524, "Nature," Sept., 1883) "The older taxonomic of Palæozoic Fern-life is with few exceptions, of little scientific value. Hooker and others have uttered in vain wise protests against the system that has been pursued. Small fragments have had generic and specific names assigned to them with supreme indifference to the study of morphological variability amongst living types. The undifferentiated tip of a terminal pinnule has had its special name, whilst the more developed structures, forming the lower part of the frond, have supplied two or three species. Then the distinct forms of the fertile fonds may have furnished additional ones whilst a further cause of confusion is seen in the wide difference existing between a young half-developed seedling and the same plant at an advanced stage of growth."

Since these observations were written Professor F. W. Hutton has contributed a most interesting article bearing upon subject ("Geological Nomenclature," pp. 59-61, *Geol. Mag.*, 1885) in which he very ably supports similar ideas. He states that it is quite impossible to squeeze the rock systems of other regions into those found in the European. They will not fit, and he therefore justly contends that all designations of sub-divisions of systems in Europe, as well as elsewhere, should have a local application only, and that in tabular or other comparisons the several local sub-divisions of a great system or era, such as the Palæozoic, should simply be treated as independent local groupings of the local sequence, against, or between which, may be approximately related the equivalent or complementary systems of distant regions. The necessity for these distinctions, although recognised by Dr. Geikie (pp. 634 636, "Text Book of Geology"), is not sufficiently appreciated by him as regards the world-wide application of European sub-divisions of great systems. For he still believes that regional names (European statedly), whatever may have been their origin, are upon the whole best adapted for general use; and accordingly he cites Cambrian, Silurian, Devonian, Permian, and Jurassic as types of this class of divisional names as having been adopted all over the globe.

Undoubtedly, so far as the three first-named systems are concerned, his remarks are perfectly true, but as regards the two latter there are difficulties in the way of their being adopted in Australasia. Professor Hutton again aptly observes (*Geol. Mag.*, Feb., 1885, p. 60). "We can always speak of the 'Palæozoic' or the 'Mesozoic' rocks of a country with all the accuracy required when using such terms, while we cannot always do the same with sufficient accuracy when referring to rocks belonging to the shorter periods or epochs. For example," he goes on to say, "I can speak of the Mesozoic rocks of New Zealand because the term is wide and makes no pretension to accuracy, but I cannot speak of Jurassic or Cretaceous rocks of New Zealand with any approach to accuracy, although our present immethodical nomenclature often compels me to do so."

These difficulties have also been pointed out by W. T. Blanford, F.R.S. (in "Classification of Sedimentary Strata," pp. 318-9, *Geol Mag.*, July, 1884). He expressly states that, "so far as the Geology of India has been studied, it appears doubtful whether the sedimentary formations of that country can be accurately classified by means of the European sub-divisions. The difficulty, it is true, is partly due to the paucity of fossils in Indian rocks, but partly also to the circumstance that *the breaks in the sequence do not correspond with those especially remarkable in Europe*." He elsewhere remarks that the same objection applies to other parts of the world.

If the stratigraphic breaks in India do not harmonise with those of Europe, what likelihood is there in finding corresponding breaks in the rocks of Australasia? I have, therefore, advanced good reasons for the course adopted by me hereafter in refraining to refer local rocks to sub-divisions of the Mesozoic Period, and also for merging the Carboniferous and Permian locally into one group, in harmony with the known facts of stratigraphy.

The Carboniferous System in Tasmania, as thus defined, is marked, stratigraphically and organically, in its lower limits by an important break, so far as its relation with the uppermost members of the clay-slates of Lower Palæozoic age can be ascertained. Whether the Upper Devonian of Europe can in Tasmania be separated from the continuous Upper Palæozoic rocks, and the Lower Devonian from the Upper Silurian slates is a matter which has yet to be decided.

Mr. Gould considered that the soft clay-slates of Fingal immediately and unconformably overlying similar clay-slates, but presenting special characters, and similarly related to the lower members of the carboniferous marine beds above, were the highest members of the Lower Palæozoic rocks known to him. No fossils, however, were found in them by him, and he classed them as the uppermost members of the Silurian age, provisionally as follows. (See p. 29, "Proceedings Royal Society of Tasmania, 1866.")

| | | | |
|---|---|---|---|
| 1. Fingal Beds...... | Clay-slates, sand-stones, and grits. | | |
| 2. Eldon Valley | Mudstones and Clay-slates. | Calymene, Orthis, Cardiola, etc. | Thin quartz reefs not abundant. |
| 3. Gordon Beds | Limestones<br>Slates<br>Limestones<br>Conglomerates<br>Quartzose Sandstone | | |

It is singular that in a piece of the uppermost clay-slates sent to me some years ago, I discovered a very well preserved species of *Anodonta*, on breaking up the specimen, also fragmentary impressions of the bark of some forms of vegetation. The species of Anodonta (which I shall for reference sake here call *A. Gouldii*, in honour of Mr. Charles Gould, who, perhaps, more than other person, contributed to our knowledge of the earlier rocks of Tasmania) is almost identical with the well known *Anodonta Jukesii*, one of the most characteristic fossils, if not the only fresh-water lammelibranch of the Lower Devonian rocks of Ireland.

The organisms, therefore, point clearly to a fresh-water origin, and the stratigraphical break above and below, also falls exactly into the position of Devonian rocks, as defined by Jukes in the following terms (p. 491, "Text Book"):—

"All rocks which were formed after the uppermost of those which can be called Silurian, and before the lowest of any which can be called Carboniferous, may be classed as Devonian rocks, and looked upon as records of Devonian time." The Upper Fingal clay and arenacious slates exactly fit into this definition, and the fresh-water organisms, *A. Gouldii*, and the vegetable impression strongly incline me to regard these slates as Devonian.

Here stratigraphy and palæontology are in harmony. The evidences collected by me from various parts of the island, respecting the sequence of the Carboniferous rocks of Tasmania, are so numerous that it would be beyond the purposes of this sketch to attempt to cite them in detail.

The characteristic rocks of the Carboniferous System in Australia and Tasmania consist primarily of thin regular bands of siliceous conglomerates, blue slaty shales, limestones, argillo-calcareous and argillo-arenaceous rocks of a yellow or white appearance, with intercalated bands near its uppermost limits, composed of fine greyish laminated shales, bituminous shales and thin coal seams. The members are, for the most part, extremely rich in fossils, of which the following is a list of the more typical forms:—

Plantae, *Glossopteris Browniana*, Brong; *Gangamopteris spathulata*, McCoy; *Tasmanites punctatus*, Newton; *Noeggerathiopsis spathulata*, Dana; *Vertebraria australis*, M'Coy; *Cordaites* sp.; *Schizoneura*, sp.; Silicified trunks of Conifers in profusion, etc.

Crustacea, *Cythere Tasmanica*, mihi.

Polyzoa, *Fenestella internata*, Lonsdale; *T. plebeia*, M'Coy; *Protoretepora ampla*, Lonsdale; *Stenopora Tasmaniensis*.

Brachiopoda.—*Leptæna*, sp.; *Orthis Mitchelini*, L'Eveillé; *Orthotetes crenistria*, Phillips; *Productus brachythyœrus*, G. Sowerby; *P. cora*, D'Orbigny; *P. fimbriatus*, J. *de* C. Sowerby; *P. fragilis*, Dana; *P. murchisonianus*, De Koninck; *P. punctatus*, Martin; *P. pustulosus*, Phillip; *P. scrabiculus*, Martin; *P. semireticulatus* (?), Martin; *P. subquadratus*, Morris; *P. undatus*, Defrance; *Rhynconella pleurodon*; *Strophalosia Clarkei*, De Koninck; *S. Jukesii*, Etheridge, Jun.; *Spirifera convoluta*, Phill.; *S. crassicostata*, Jukes; *S. Darwinii*, Morris; *S. glabra*, Martin; *S. lata*, M'Coy; *S. oviformis*, M'Coy; *S. Stokesii*, King; *S. Strezeleckii*, De Koninck; *S. Tasmaniensis*, Morris; *S. trigonalis* (?), Martin; *S. vespertilio*, G. Sowerby; *Terebratula sacculus*, Martin.

Mollusca, proper—*Allorisma curvatum*, Morris; *Aviculopecten Fittoni*, Morris; *A. Hardyi*, De Koninck; *A. Illawarensis*, Morris; *A. limæformis*, Morris; *A. ptychotis*, M'Coy; *A. squamuliferus*, Morris; *A. Tasmaniensis*, M'Coy (m.s.); *A. tesselatus*, Phillips; *Cardiamorpha striatella* (?), De Koninck; *Edmondia striatocostata*, M'Coy; *Eurydesma sacculus*, M'Coy; *Modiolo crassissima* (?), M'Coy; *Modiolopsis*, sp; *Notomya*, sp; *Orthonata compressa*, Morris; *Pachydomus carinatus*, Morris; *P. globosus*, J. de C. Sowerby; *P. ovalis*, M'Coy; *P pusillus* (?), M'Coy; *Pterinea macroptera*, Morris; *Pteronites latus*, M'Coy; *Sanguinolites Etheridgei*, De Koninck; *Tellinomya Clarkei*, De Koninck; *Bellerophon convolutus*, De Koninck; *Capulus*, sp.; *Euomphalus catillus*, Martin; *E. Bigsbyi*, De Koninck; *E. minimus* (?), M'Coy; *Pleurotomaria*, *Morrisiana* M'Coy; *P. Woodsii*, Johnston; *Connularia* sp.; *Theca lanceolata*, Morris; *Cameroceras Phillipsii* (?), De Koninck; *Goniatites micromphalus*, Morris.

To these might be added many more examples now awaiting determination in my collection. In the greater number of cases it will be observed that the species are identical with those given in similar formations in New South Wales, where owing to the energy of the late Rev. W. B. Clarke, and to the skill of De Koninck, the fossils of that country have been worked out more fully and systematically.

As regards New South Wales, De Koninck tablulates 316 species of fossils, as follows :—

| | Genera. | Species. |
|---|---|---|
| Upper Silurian | 43 | 62 |
| Devonian | 38 | 74 |
| Carboniferous | 73 | 180 |
| Total | 154 | 316 |

Of the fauna, 81 species at least are common to the Palæozoic formations of Europe, while many of the typical plants of the Carboniferous coal measures of Australasia are at least generically identical with those found in India in rocks of supposed Mesozoic age.

The various members of the Carboniferous System in Tasmania, are more or less horizontally disposed, although greatly dislocated by more recent intrusions of greenstone and secular upheaval, and subsequently subjected to great long continued denudation. The varying altitudes at which apparently the same members are found, together with the valleys of erosion so common throughout the country, show the vastness of the dynamical agencies which have operated upon them since their deposition.

Generally its members are so intimately associated with the older and newer diabasic greenstones that they cannot very well be considered apart in any attempt to describe them. It will be observed from the Geological sketch, recently prepared by Mr. Sprent and myself, that the diabasic greenstones form the elevated plateaus and mountains, as well as the principal minor dividing ranges throughout a great part of the Midland, Northern, Eastern, and South-Eastern parts of the island, and that they may be said to be comparatively, if not wholly, absent from the extreme western part, where the older Silurian and Metamorphic rocks prevail with their associated granites and porphyries.

The great central greenstone plateau of the Lake Country, in its Northern part especially, preserves a general rugged or undulating level of about 4,000 feet altitude, and its higher bosses and peaks, and its valleys do not vary much more than 1,000 feet above or below this uniform level. From the Picton to Gad's Hill, a distance northerly of over 100 miles its westerly limit may be roughly traced, forming a bold and widely undulating margin relative to the western country, whose immediate general upland surface ranges between 2,000 and 3,000 feet above sea level. This margin is markedly broken by the elevated outlying spur forming the Eldon Range near Lake St. Clair. From Gad's Hill in a south-easterly direction to the Table Mountain, a distance of not less than 90 miles, its similarly indented margin presents a still bolder character as it approaches and contrasts with the lower fertile plains and valleys of the Meander and South Esk, which seldom exceeds an altitude from 600 to 700 feet above sea level. At the great Northern and Southern water divide, in the neighbourhood of the Table Mountain, it suddenly recedes and contracts, forming a large bight in the direction of the Upper Derwent tributaries, notably the rivers Nive and Ouse, from which its level tends to fall, and its marginal boundaries, though frequently rising into high mountain ridges towards Mount Wellington, no longer maintains the uniform boldness of outline which characterises it in its northerly aspect.

With the exception of Ben Lomond, which attains an altitude of 5,010 feet, the remaining isolated or ramifying greenstone dividing ranges, distributed throughout the basin of the Tamar, Derwent, and Coal River, and along the broken or deeply indented coast line of the East, are tame in character when compared with the elevated far-extending tiers of the Great Central Plateau.

Nearly everywhere along and against this plateau, and the greenstone crests of Ben Lomond, Mount Dromedary, Mount Nicholas, Eldon Range, Mount Gell, Grass Tree Hill, Constitution Hill, and most of the more elevated South-Eastern dividing ranges, the various members of the Carboniferous and Mesozoic rocks are seen to repose invariably almost in an horizontal position, or, at most, with a very slight dip towards or away from them. This general character is best appreciated by following the dark-grey color bands of the Upper Palæozoic and Mesozoic rocks as described in the sketch map referred to.

In my opinion it would seem probable that the greater part of the greenstone rocks were erupted prior to the deposition even of the lower members of the Carboniferous mudstones, and at a time when, from secular causes, the older rocks of the South-Eastern and Central parts of the island, after long subærial exposure, were slowly being submerged below the level of the Upper Palæozoic sea. So far as existing evidences show, it seems to me that this depression must have occurred towards the close of the Devonian, or at the commencement of the Carboniferous, period. Strzelecki, who was the first observer who graphically described these rocks, thought that the main masses of greenstone forming the Western and such mountain chains as Mount Wellington and Ben Lomond, were erupted subsequent to the deposition of the

Mesozoic rocks, and that the former were intruded through the latter and formed vast sheets, which, as overspreading caps, protected them in a large measure from the great denudation which undoubtedly occurred subsequently and of which there is the most abundant evidence throughout the plains and valleys lying within the limits of the Upper Palæozoic and Mesozoic Systems.

Dr. Milligan and Chas. Gould also followed Strzelecki in this opinion, as all of these writers in their ideal sections picture the sedimentary formations as dipping continuously under the elevated greenstone mountains and tiers, against which they have already been described as abutting more or less horizontally. Jukes, however, was doubtful of this relationship, and discussed the probability of certain greenstone masses being of older date than the sedimentary rocks. In the latter case we would have to assume that the narrow lineal strips of Carboniferous sedimentary rocks, as also the overlying coal measures, with their denuded and precipitous faces, flanking the main greenstone tiers and mountain ranges are, with the wasted members of the lower valleys and plains, only the mere remnant of a once greatly extended sedimentary formation, which, by long-continued action of subaerial erosive agencies, were cut and wasted away in the formation of later deposits, and whatever elevation and dislocation has taken place locally subsequent to their deposition the earlier eruptive greenstone upon which they flank or rest may also have been similarly affected by them. The consequences of this assumption would therefore lead one to infer that the vertical faces at the higher levels abutting against the greenstone slopes are mainly the result of denudation rather than dislocation. No doubt, repeated general elevation movements in later times may account for some of the examples. At any rate, the greater elevation would intensify the erosive agencies. This assumption, although seriously affecting our prospects as regards the extension of our coal seams beneath the tiers in various parts of the island, has been demonstrated to be perfectly true so far as the greenstone and sedimentary rocks on the flanks of Mount Wellington are concerned. A section at the Cascades on the flank of Mount Wellington was practically tested by the Government during the previous year for the purpose of determining whether the Lower Coal measures as represented in the Mersey Basin, existed beneath the fossiliferous marine mudstones and limestones which occur at the place named, and which appear to dip gently in the direction of Mount Wellington. After the diamond-drill penetrated through 600 feet of alternating layers of calcareous mudstones and limestones, without discovering the existence of the lower coal measures, it pierced immediately some feet into the massive diabasic greenstone, similar in character to that forming the cap of Mount Wellington. It is further of significance that the absence of any appearance of change of the mudstones at point of contact, and the porphyritic and coarse crystalisation of the upper surface of the greenstone as compared with that where the greatest depth was reached indicate that the mass of greenstone was not a later lateral thrust along the plane of the bedding of the mudstone, but in all probability the mudstones were originally deposited against and upon the greenstones of Mount Wellington soon after their eruption.

In various places along the Coast line of the Lower Derwent, as I have already shown, many natural sections occur where the fossiliferous mudstones, unaltered at point of contact, without doubt, repose quietly in horizontal beds, which naturally fill up the uneven surface of the underlying older greenstone I have already exhibited a sketch of a very fine section, which continually shows this relation for several miles between Blackman's Bay and Passage Point. One section in particular not only shows in an unmistakable manner that the fossiliferous mudstones are more recent than the main mass of the older greenstone upon which they rest, but that both are older than a minor dyke or sheet of greenstone of a somewhat similar character to the older. This intrusive greenstone, after bursting vertically through the older greenstone and the lower beds of sedimentary limestone, suddenly bends back and forms a sheet about seven feet thick, running parallel and intercalated between the stratified planes of the marine mudstones and limestones. At Constitution Hill and Lovely Banks, towards the central part of the island, there are also two or three fine sections in the cuttings of the Main Road, clearly showing the Mesozoic sedimentary rocks reposing upon the older greenstone. On the other hand a splendid section at the head of Spring Hill as clearly shows that a massive greenstone (not basalt) has been erupted later than the carbonaceous sandstones of Mesozoic age, as the greenstone mass forming the ridge at this place can be seen to have intruded through the former, dislocating the sedimentary rocks, and spreading over them in great massive caps. It is clear therefore that there are greenstones anterior to the lowest members of the Carboniferous System, and similar intrusive rocks of later date than certain of the members belonging to the Mesozoic Coal Measures.

I am however, at present, if anything, inclined to the opinion that the massive greenstones occupying the more elevated mountain ranges as well as the greater part of the dividing ranges within the system, have all been erupted prior to the deposit even of lower members of the Carboniferous System, and that only certain minor ridges, like that at Spring Hill, represent diabasic greenstones of a later date. There is little difficulty in distinguishing these Upper Palaeozoic and Mesozoic greenstones from the sheets of basalt, which, with their associated tufts, so frequently overspread the Tertiary lignites and leaf beds, and which probably mark the close of the Tertiary Palæogene period in Tasmania.

The rocks of the Carboniferous System invariably present a very uniform character throughout the southern part of Tasmania. In the Basin of the Mersey there is greater variation, caused by a temporary local elevation and subsequent depression of the floor of an old arm of the Upper Palæozoic sea, between which elevation and depression sedimentary deposits of carbonaceous matter of considerable thickness were formed, derived from a luxuriant land vegetation consisting of Club mosses, from which the spores of *Tasmanites punctatus* were no doubt derived. Ferns and Equisetaceæ were also abundant, as indicated by the remains of Glossopteris Gangamopteris and Schizoneura.

The bituminous Tasmanite shales were deposited in an arm of the sea, not in fresh water, as shown by the abundance of the remains of marine mollusca found in the Tasmanite notably *Aviculopecten squamuliferus, A. Fittoni, Pleurotomaria, Woodsii, Pachydomous, Pterinea lata,* s.p. and several other forms common to the marine beds above and below the Mersey Coal Measures.

Until very recently, I was in doubt whether the marine mudstones and limestones in the neighbourhood of Hobart, and in the South generally, represented the lower marine beds only, or whether they represented in one continuous series the upper and lower marine beds as developed in the Mersey Basin. The possible existence of the Lower Coal Measures underlying the marine mudstones made this a very important question, and it was this consideration which induced the Government to make the test at the Cascades already described, but which demonstrated the fact that no coal existed beneath the mudstones at this point. Before this practical test, little value could be attached to conclusions formed upon the partial evidence of marine fossil organisms alone, because a considerable per-centage of the species of the the marine organisms common to the mudstone series overlying the Mersey Coal Measures was also common to the underlying or lower marine beds, and also to the Tasmanite group. Among the fossils common to these deposits are the well-known forms:—*Spirifera Tasmaniensis, S. Darwinii Terebratula sacculus, Productus brachythyœrus, Pterinea lata, Sanguinolites Etheridgei, Pecten Fittoni, P. squamuliferus, P.*

*Illawarra*, *Pleurotomaria Morrisiana*, *P. Woodsii*, *Tellinomya Clarkei*, *Theca lanceolata*, and many others. With such equivocal information the evidences based upon a few marine organisms taken by themselves were of little value. Some, however, thought that the test of the diamond-drill, showing the absence of coal seams, indicated that the lower marine group alone were represented in the neighbourhood of Hobart. With this view, I was not prepared to concur as may be learned from the following remarks made at the time before the members of this Society :—

" If, therefore, it be allowed that the Mersey and Southern and Eastern coal deposits represent different horizons, the evidences from marine organisms, taken by themselves with our present knowledge, are absolutely valueless, at any rate neutral. It is from an examination of the plant remains, associated with the respective coal measures, that we have any grounds for separating them into different groups, as representing different periods. Thus the prevailing plant remains of the Coal Measures of the Mersey, which are the equivalents of the Stony Creek, Anvil Creek, and other coal seams in New South Wales, are *Glossopteris Browniana;* equisetaceous stalks, broadly and flatly ribbed, allied to the genus *Schizoneura;* a curious orbicular form allied to *Actinopteris;* and numerous impressions of a form closely allied to *Noeggerathiopsis media.* On the other hand, the Midland, Southern, and Eastern coal measures of Tasmania have generally as prevailing forms *Alethopteris Australis*, *P. odontopteroides*, *Phyllotheca Hookeri*, *Phyllotheca ramosa*, *Sphenopteris alata*, *Zeugophyllites elongatus*, and *Glossopteris linearis*, and, therefore, the beds may, without doubt, as already shown by Feistmantel, Rev. W. B. Clarke, R. Etheridge, junr., and others, be regarded as the equivalents of the Upper Coal Measures of New South Wales. Regarded from an evolutionist's point of view, it is very difficult to recognise any break, stratigraphic, or organic, between the upper and lower mudstone series of Australia, so far as the marine organisms of undoubted Palæozoic facies gave any evidence. If these subdivision were to be classed as Upper Palæozoic, and the Upper Coal Measures, according to various authorities, as Permian, Oolitic, Dias, or Mesozoic, the separation must be doubtful and purely one of local convenience. I am not prepared to concur in regarding the sandy and calcareous fossiliferous rocks occurring in the neighbourhood of Hobart, and in other localities in the South and East, *wholly* as the equivalents of the Lower Marine Beds of New South Wales, for it was not only conceivable but, unfortunately, probable that the Southern Marine beds of Tasmania were formed in situations more remotely removed from the oscillation of the land which produced the conditions favourable to the deposits of the Lower Coal Measures in such places as the Don, Mersey, Stony Creek, and Anvil Creek basins; that while these carbonaceous deposits intercalcating and interrupting the series of marine beds were being formed in situations adjacent to the shores of the old Palæozoic mainland, the marine areas, more remote from the land, still continued to deposit their marine sediments with an uninterrupted chain of marine organic life; and it is quite conceivable, and, indeed, in harmony with existing evidence, that the Southern and Eastern Marine Beds of Tasmania cover in one unbroken series the whole period represented in Australia and in Northern Tasmania by the Lower Marine Beds, Lower Coal Measures, and Upper Marine Beds; and that the final oscillation of land, producing conditions favourable to the deposits of the Upper Coal Measures of Australia and Tasmania, was the only one which extended as far as the South and East of Tasmania."

The suggestion that the marine beds in the neighbourhood of Hobart cover in one unbroken series, the whole period represented elsewhere by the Lower Marine Beds the Lower Coal Measure, and the Upper Marino Beds, has since been amply confirmed by my discovery of the Cythere and Gangamopteris beds at Porter Hill, near Hobart. The beds at this place. unmistakably show a gradual transition upwards, without stratigraphical break of any kind, from the common limestones restricted to marine organisms to fine sandy shales where the marine organisms have altogether disappeared with the exception of a minute ostracod. These upper beds are replete with plant remains of ferns, chiefly belonging to the genus Gangamopteris. The fossiliferous marine limestones and mudstones replete with the common forms belonging to the genera Stenopora. Protoretepora, Fenestella, Spirifera, Strophalosia, Terebratula, etc., are followed by thin passage beds of alternating soft dark-brown sandstones, and friable shales where most of the common lower forms disappear with the exception of *Spirifera Tasmaniensis* and *S. Darwinii.*

In these shales a species of *Cythere* swarms in the greatest number, together with species belonging to the genera *Modiolopsis*, *Tellinomya*, and *Theca.* In the same beds, also, the plant remains referred to begin to make their appearance, and in the uppermost shales the plant remains and an occasional *Cythere,* together with the articulated spines, probably of a species of *Ichthyodorulites,* alone are to be found. There is little doubt, therefore, that these upper beds are the equivalents of the Tasmanite stage or of the Upper Marine Beds of the Mersey.

The finest sections of the Marine Beds of the system are exposed at Maria Island, although anyone may get a very full acquaintance of all the known characteristic fossils and rocks, in the many exposed sections along the Huon Road, One Tree Point, and Shot Tower, in the vicinity of Hobart.

Generally, then, we may consider that the Carboniferous Marine Beds formed the sediment or floor of a strait or frith of the ancient Upper Palæozoic sea. So far as I can read existing evidences, it would seem most probable that, during this period, Tasmania was represented by three principal islands, and several detached groups of smaller islets. The largest of the former probably represented a narrow and irregular strip of land running obliquely and continuously North and South between the extremes of the granite headlands of the Hummock Island in the North East, to the bold schistose rocks towards South Cape. Towards the centre of the present land limits of Tasmania, and scarcely separate from the narrow strip of land to the West, what now forms the great inland greenstone plateau of the Lake Country probably formed an elevated island mass of considerable extent. Towards the North East and East the granites and metamorphic portion of the Furneaux Group, Portland, Ringarooma, Schoutens, together with the massive greenstone in the neighbourhood, Fingal, Swansea, Tasman and Forester's Peninsula, South Bruni, must have formed a somewhat irregular detached chain where not broken by the minor or isolated masses which must have formed rocky islands, such as Ben Lomond, Mount Victoria, Tower Hill, Mount Nicholas, Eastern Tier, Black Tier, Mount Dromedary, Grass Tree Hill, Constitution Hill. The interspaces of the shallow elongate basin, now forming the major part of cultivated settlements, was occupied by the Upper Palæozoic sea, which would seem to have formed a comparatively broad strait between the the easterly detached chain of islets, and the two principal islands to the West, which were themselves divided by a very linear strip of water. It is hazardous to assume what may have been the altitude of the island masses relatively to this old sea level. But there is some ground for the opinion that the great central greenstone island, especially in its northerly limits, rose abruptly from the old sea level, and presented a bold escarpment of from two or three thousand feet altitude. The sediments of this old sea forming the greater part of our Carboniferous rocks, are now often found flanking the mountain-tiers, as at Mount Wellington, at altitudes of from 2,000 to 2,500 above the existing sea level. With the overlying Mesozoic Coal Measures, they everywhere give evidence of having been frequently disturbed by forces of upheaval or depression, and their members have been vastly denuded throughout the limits of the basin, whose limits have been thus roughly sketched.

### MESOZOIC ROCKS.

The Mesozoic Period has been aptly termed the "Age of Cycads," because of the abundance of plants of this type of the Mesozoic age. With the exception of the Mersey Coal Measures, it has now generally been admitted that the various coal seams, and associated shales, and variegated sandstones overlying the Upper Marine Beds of Carboniferous age in Tasmania, belonging to the Mesozoic Period. These rocks are mainly distributed throughout the Midland and South-eastern parts of the island, although the existence of coal at a great height, near the Eldon Range, on Coal Hill, with remains of the variegated sandstones flanking all the great western tiers, associated with the Carboniferous rocks, indicate that the numbers of the Mesozoic rocks were probably at one time conterminous with those of the Carboniferous rocks,

With the exception already named, therefore, the dark-grey shading of the sketch map, and perhaps a considerable portion concealed under the Launceston Tertiary's Basin colored yellow, make up the whole area within which the several basins of the Mesozoic rocks occur.

In a general way the existing evidence tends to show that, as the floor of the ancient Upper Palæozoic sea was gradually being elevated above its waters at the close of the Carboniferous period, æolian, atmospheric, and organic agencies immediately began to operate upon it in carving out valleys and river-channels, and in filling its many cup-shaped basins and irregular hollows with lakes and sediments. It is mainly from such waste, and by such agencies, modified by igneous intrusions, that the sediments and materials of the lower rocks of the Mesozoic period were deposited in Tasmania.

So far as my observations go, there is every reason to believe that the larger part of its surface, including that portion of the Upper Palæozoic rock underlying the Tertiary lake deposits (coloured yellow), has been permanently elevated above sea level since the close of the Upper Palæozoic age—that is, since the Upper Marine Beds, with their characteristic spirifers, fenestellæ, stenoporæ, etc., were elevated above the waters of the sea at the close of the Palæozoic Period in Tasmania.

If this be admitted—which can hardly be doubted—it follows that there should be found throughout the area now occupied by Secondary and Tertiary rocks a connected, although, perhaps necessarily, a greatly broken and wasted, representation of all the original rocks of the two great divisions. It is not likely that the fluviatile and subaerial agencies, however prolonged or intense, would altogether destroy the older deposits in the formation of the later rocks; and it is reasonable to assume, where there are no sudden breaks, such as occur elsewhere, by the sudden alternation of Marine and Terrestrial formations, that the transition, as even now indicated by the fossil flora, would be very gradual in the limited basins where sediments were deposited, which, probably, were again and again partly re-distributed, as successive formations in gradually lessening areas. Nor can it be reasonably expected, where such separate minor basins are so intimately related to each other, that marked breaks in the chain of organic life, should be apparent, and therefore it would be extremely hazardous to assume that the identity of even one or two species in separate basins was sufficient evidence to mark synchronism between them, especially so where the associated prevailing forms of the one basin differ materially from the other. On the other hand, different conditions, such as soil or altitude, might account for a considerable amount of difference between two widely separate basins, although the evidence in this latter direction would not be quite satisfactory where the two separate basins were only separated by a line from slightly unconformable beds in juxtaposition.

From considerations such as these, and while willing to recognise the fact that all the European subdivisions, may be represented by equivalents in Tasmanian Rocks, I still think it would be altogether unscientific to expect that the many little groups of our Mesozoic rocks, as a whole, will show the faintest correspondenc with the ternary sub-groups (Triassic, Jurassic, Cretaceous), as such. To attempt to make corresponding divisions in Tasmania, with our present knowledge respecting stratigraphy and palæontology, would be purely artificial and altogether misleading. In the meantime, I am of opinion that the stratigraphic and organic characteristics of each separate basin or group of rocks should first be carefully and fully marked and related to each other. Until some satisfactory limits have been determined, I think you will agree with me that it would be rash to refer the various local basins of Mesozoic age under any of the great sub-division groups of Europe. In harmony with these observations and as a practical contribution to the materials necessary to aid in the proper classification and correlation of our Mesozoic rocks, I have prepared a table, showing the distribution of all the Tasmanian plants of the system known to me, in which are included a considerable number of forms not hitherto known as occurring in Tasmanian rocks.

In addition to this, I have prepared a full description of each species, including a considerable number which I believe to be new to science.

Another table prepared for this paper illustrates the views advanced by me regarding the classification of stratified divisions.

# TASMANIAN FOSSIL PLANTS OF THE UPPER PALÆOZOIC AND MESOZOIC COAL MEASURES.

| DESCRIPTION. | TASMANIA (MESOZOIC). | | | | | | | | | | | | | | TAS. UP. PAL. | | N.S. WALES | | | VICTORIA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NEW TOWN. | RICHMOND. | CAMPANIA. | CONSTITUTION HILL. | JERUSALEM. | SPRING BAY. | IMPRESSION BAY. | SEYMOUR. | YORK PLAINS. | FINGAL. | BEN LOMOND. | MT. NICHOLAS, KILLYMOON. | LONGFORD. | SPRING HILL. | PORTER HILL. | MERSEY. | WIANAMATTA BEDS. | UPPER COAL MEASURES. | LOWER COAL MEASURES. | UP. DEVONIAN. | MESOZOIC ROCKS. |
| EQUISETACEÆ. | | | | | | | | | | | | | | | | | | | | | |
| *Phyllotheca Australis*, Brong ... ... ... | * | * | * | * | * | * | ... | ... | * | ... | ... | ... | ... | ... | ... | ... | * | * | ... | ... | * |
| ,, *ramosa*, M'Coy ... ... ... | * | * | * | * | * | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | ... | ... | * | | | |
| ,, *Hookeri*, M'Coy ... ... ... | * | * | * | * | * | ... | ... | ... | * | ... | ... | ... | * | ... | ... | ... | ... | * | | | |
| *Vertebraria Australis*, M'Coy... ... .. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | * | | | | |
| FILICES. | | | | | | | | | | | | | | | | | | | | | |
| *Sphenopteris lobifolia*, Morris ... ... ... | * | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | |
| ,, *alata*, Brong ... ... ... | * | ... | ... | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | |
| ,, *elongata*, Carr ... ... ... | * | * | ... | ... | ... | * | ... | ... | * | ... | ... | ... | ... | * | | | | | | | |
| ,, *plumosa*, Brong ... ... ... | * | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | |
| *Trichomanides Ettingshauseni*, Johnston | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | | | |
| *Cyclopteris cuneata*, Carr ... ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | | |
| *Gangamopteris angustifolia*, M'Coy ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | |
| *Rhacopteris Feistmantelii*, Johnston ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | |
| ,, *intermedia*, Feist... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | |
| ,, *inaequilatera*, Goepp ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | |
| *Thinnfeldia obtusifolia* ** Johnston ... | * | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | ... | * | | | | | | | |
| ,, *superba* ** Johnston ... ... | ... | ... | ... | ... | ... | * | | | | | | | | | | | | | | | |
| ,, *trilobita*, Johnston ... ... | ... | ... | ... | ... | ... | * | | | | | | | | | | | | | | | |
| ,, *media* ** Woods ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | * | | | |
| ,, *odontopteroides*, Morris ... | ... | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | * | * | ... | ... | * |
| *Pecopteris tenuifolia*, M'Coy ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | *? | ... | ... | * | | | | |
| ,, *caudata* Johnston ... ... ... | ... | ... | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | * | | | | | | | | |
| *Alethopteris Australis* Morr ... ... ... | * | ... | ... | ... | ... | * | * | ... | * | ... | * | ... | * | ... | ... | ... | ... | ... | ... | ... | * |
| *Taeniopteris Tasmanica*, Johnston ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | * | | | | | | | |
| ,, *Morrisiana*, Johnston ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | | | | |
| *Glossopteris Browniana*, Brong ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | * | | |
| ,, *linearis*, M'Coy ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | ... | ... | ... | * | | |
| ,, *ampla* ... ... ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | * | ... | ... | * | | |
| *Gangamopteris spathulata*, M'Coy. ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | * | | |
| ,, *obliqua*, M'Coy ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | | |
| *Sagenopteris Tasmanica*, Feist ... ... | ... | ... | ... | ... | + | | | | | | | | | | | | | | | | |
| LYCOPODIACEÆ. | | | | | | | | | | | | | | | | | | | | | |
| *Tasmanites punctatus*, Newton ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | |
| *Lepidostrobus Müelleri*, Johnston... ... | ... | ... | * | | | | | | | | | | | | | | | | | | |
| CYCADACEÆ. | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | | | | | | |
| *Podozamites* Sp. ... ... ... ... ... ... | ... | ... | ... | ... | ... | | *? | | | | | | | | | | | | | | |
| *Zeugophyllites elongatus*, Morr. ... ... | * | * | ... | ... | * | ... | * | * | * | ... | * | ... | * | ... | ... | ... | ... | ... | * | | |
| *Nöggerathiopsis spathulata*, Dana ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | * | *? | |
| *Cordaites* Sp. ... ... ... ... ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | * | ... | ... | ... | * | |
| Coniferous Trunks of Trees ... ... ... | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | | | | | |

** Considered to be merely varieties of the protean *T. Odontopteroides*. Morris.

## LOCAL DISTRIBUTION.

The foregoing table will be useful to students who may be interested in the distribution of the Fossil Plants of the Upper and Lower Coal Measures of Tasmania.

Further particulars are given in the following summary :—

### I.—LOWER COAL MEASURES. (UPPER PALÆOZOIC.)

#### MERSEY COAL BASIN.

*Don and Mersey Coal Measures.*

Glossopteris Browniana, Brong., abundant.
Gangamopteris spathulata, M'Coy, abundant.
Gangamopteris angustifolia, M'Coy, abundant.
Gangamopteris obliqua, M'Coy, abundant.
Noeggerathiopsis media (?), common.
Noeggerathiopsis spathulata, common.
Schizoneura, sp. (?), rare.
Curious orbicular scale with marginal rim, and ornamented with curved furcate vein-like septæ as in Actinopteris, rare.
Carpolithes (?) Tasmanicus, mihi, abundant.

*Tasmanite Beds.*

Tasmanites punctatus, Newton, prolific.

*Mersey Upper Marine Beds.*

Gangamopteris angustifolia (?), M'Coy, rare.

*Porter Hill Beds. Hobart.*

Gangamopteris ampla (?), abundant.
*Cyclopteris cuneata*, Carr., rare.
Equisetaceous, stems abundant.

The apex of a pinnule was also obtained in these beds, which probably belongs to the genus *Pecopteris*. The Upper Marine Beds, at Porter Hill are remarkable as showing connection with the Lower Marine Beds in a complete unbroken series.

### II.—UPPER COAL MEASURES. (MESOZOIC.)

*New Town Coal Basin.*

Zeugophyllites elongatus, Morris, abundant.
Phyllotheca Hookeri, M'Coy, abundant.
Alethopteris Australis, Morris, abundant.
Thinnfeldia odontopteroides, var., obtusifolia, Morris, common.
Sphenopteris alata, Brong., prevailing form.
Sphenopteris plumosa, Brong., common.
Sphenopteris lobifolia, Morris, common.
Sphenopteris elongata, Carr., common.
Sagenopteris (?), rare.

No species of Glossopteris or Tæniopteris observed.

*Richmond Coal Basin.*

Zeugophyllites elongatus, Morris, common.
Phyllotheca Hookeri, M'Coy, abundant.
Sphenopteris elongata, Carr., abundant.

*Jerusalem Coal Basin.*

Lepidostrobus Muellerii, Johnston, one specimen.
Zeugophyllites elongatus, Morris, abundant.
Phyllotheca Hookeri, M'Coy, abundant.
Phyllotheca Australis, Brong., abundant.
Alethopteris Australis, abundant.

*Spring Bay Coal Beds.*

Phyllotheca Australis, Morris, common.
Sphenopteris elongata, Carr., common.
Thinnfeldia superba, Johnston, common.
Thinnfeldia trilobita, Johnston, common.
Pecopteris caudata (?), Johnston, common.
Alethopteris Australis, Morris, common.

*Impression Bay and Coal Mine Beds, Tasman's Peninsula.*

Phyllotheca Australis, Brong., common.
Sphenopteris alata (?), Brong., common.
Alethopteris Australis, Morris, common.

*Ben Lomond Coal Beds.*

Zeugophyllites elongatus, Morris, abundant.
Alethopteris Australis, Morris, abundant.

No other form could be obtained in the shales where these two forms are so abundant.

*Mount Nicholas Coal Beds.* (Killymoon seam.)

Glossopteris linearis (?) M'Coy, common.
Zeugophyllites elongatus, Morris, abundant.

*Seymour Coal Measures.*

Zeugophyllites elongatus, Morris, abundant.
Alethopteris Australis, Morris, abundant.

Occur in the same way as at Ben Lomond.

*Campania Sandstones and Shales.*

Phyllotheca Hookeri, M'Coy, abundant.
Lepidostrobus Muellerii, Johnston, one specimen.
Minute, concentrically striated, winged scales, abundant.

*Gravelly Beach.—Rosevear Sandstones.* Tamar.

Phyllotheca Australis (?), common.
Thinnfeldia odontopteroides, Morris, common.
Silicified trunks of coniferous trees, abundant.

*Constitution Hill Beds.*

Broad, variable, coarsely marked stems of *Phyllotheca Australis*, and *Phyllotheca Hookeri*

Very abundant in many places in the sections along the main road. The absence of all other forms is very remarkable in these beds.

*Spring Hill Beds.*

Thinnfeldia odontopteroides, Morris, var. obtusifolia, prevailing form. Abundant.
Thinnfeldia odontopteroides, var. media, common.
Sphenopteris elongata, Carr., not uncommon.
Trichomanides Ettingshauseni, Johnston, not uncommon.
Tæniopteris Tasmanica, Johnston, common.
Rhacopteris Feistmantelii, Johnston, common.

The absence of ***Zeugophyllites elongatus***, **Morris**, ***Alethopteris Australis***, Morris, and of the various species of ***Sphenopteris*** and *Phyllotheca* is here worthy of special notice, so far as the beds containing the above species are concerned. **This is** specially remarkable as Strezelecki positively states ( p. 128 "Physical Description of N.S.W. and V.D.L.") that in a section of a well sunk at the locality of London Inn, near to the beds referred to, he discovered ***Alethopteris Australis*** and *Zeugophyllites* overlying a seam of coal.

*York Plains Coal Beds.*

Zeugophyllites, elongatus, Morris, abundant.
Phyllotheca, Australis, Brong., common.
Phyllotheca, ramosa, M'Coy, common.
Phyllotheca, Hookeri, M'Coy, abundant.
Thinnfeldia obtusifolia, abundant.
Alethopteris Australis Morris, very abundant.
Pecopteris caudata (?), Johnston, common.
Sphenopteris sp, common.

*Longford Coal Beds* (Mason's Seam).

Zeugophyllites elongatus, Morris, abundant.
Phyllotheca Hookeri, M'Coy, common.
Alethopteris Australis, Morris, common.
Pecopteris caudata, Johnston, common.
Tæniopteris Morrisiana, Johnston, rare.

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## PLANTAE.

### CLASS ACROGENS. *(Al Lycopodales.)*

### Ord. Marsileaceae (?).

### VERTEBRARIA (Royle).

*Gen. Char.*—Stem slender, surrounded by densely aggregated whorls of verticillate, cuneiform leaves, having a dichotomous neuration.

### VERTEBRARIA AUSTRALIS (M'Coy).

*Sp. char.*—Leaves constantly eight in each whorl.

*Localities.*—TASMANIA (?). N.S. WALES—Mulimbimba.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 147, t. 9, f. 1 ; ibid, Proc. Roy. Soc., V.D. Land, 1851, I., p. 304, t. 9, f. 1 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 101.

### EQUISETUM.

***Fructificationes in spicam ovato-oblongam digestæ. Singula orbiculata basi dehiscens pluribus valvulis, apice plano peltato connexis.***

The definition of Schimper (Paleontologie vegetale, vol i., p. 259), remedies this:—It is ***Fructus spicaeformis cylindraceus oblongus, seu ovatus, sporangiorum receptaculis peltoidis. Folia in vaginam connata.*** (Tenison-Woods).

### PHYLLOTHECA.

*Gen. Char.*—Stem slender, jointed, simple, or branched ; branches springing from above the joints, not arranged in the same plane; surface smooth or longitudinally sulcated; articulations surrounded by sheaths, the free edge of which terminates in long narrow leaves, having a more or less distinct midrib. Inflorescence arranged in whorls near the extremity of certain branches.

### Phyllotheca Australis (Br.)

Stem simple, smooth, or slightly striated; sheaths tight, shorter than the internodes, terminated by narrow leaves, double the length of the sheaths, without distinct midrib.

*Localities.*— Tasmania— Upper Coal Measures (Mesozoic). Jerusalem, Constitution Hill, Spring Bay, Gravelly Beach, Tamar (?) York Plains. N.S. Wales—Anvil Creek, Newcastle, Clarke's Hill, Wianamatta. Victoria—Cape Paterson.

*References.*— Brongniart Prodrome, 1828, p. 152; Morris, Strezelecki's Phys. Descrip. N.S.W. and V.D. Land, 1845; Lindley and Hutton, Foss. Flora, 1833—35 II. p. 89; M'Coy, Annals, Nat. Hist., 1847, XX., p. 196; Ibid, Proc., Roy. Soc. V. D. Land, p. 312; Schimper, Traité Pal. Veg., 1869, I., p. 289; Tenison Woods. Proc. Lin. Soc. N. S. Wales, 1883, vol. VIII., pt. I., p. 69-73; R. Etheridge, Jun., Cat. Aust. Fossils, 1878, p. 98.

### Phyllotheca ramosa (M'Coy).

Stem branched, smooth, or slightly striated; sheaths half the length of the internodes; leaves thin, linear, flat, twice to three times the length of the sheath, with a very fine indistinct midrib.

*Localities.*—Tasmania--Upper Coal Measures (Mesozoic), Richmond, Spring Bay, York Plains, Jerusalem. N.S. Wales—Mulimbimba.

*References.*—M'Coy Annals Nat. Hist, 1847., XX., p. 156, t. 11, figs 2 and 3; ibid Proc. R. Soc. V.D. Land, 1851, I., p. 312, t. 11, figs 2 and 3; Schimper Traite de Pal. Veg., 1869, I., p. 289; Tenison-Woods Proc. Lin. Soc. N.S. Wales, 1883, vol. VIII., pt. 1, p. 72-73; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 99.

### Phyllotheca Hookeri (M'Coy).

*Sp. Char.*—Stem simple, coarsely sulcated and ridged longitudinally; sheaths very large, loose, subinfundibuliform, each sheath extending from one articulation to the next, so as to conceal the stem; leaves about twice the length of the sheaths, thick, narrow, and with a strong prominent midrib.

*Localities.*—Tasmania—Upper Coal Measures (Mesozoic), New Town, Richmond, Jerusalem, Longford, York Plains, Constitution Hill, Impression Bay, Hamilton. N. S. Wales—Mulimbimba, Clark's Hill, Arowa.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 157, t. 11 figs. 4-7; ibid, Proc. R. Soc., V.D. Land, 1851, p. 313; Schimper, Traite Pal. Veg., 1, 1869, 1, p. 289; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883. Vol. VIII., pt. 1, p. 72-74; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 99.

### SPHENOPTERIDEÆ.

Including *Sphenopteris*, *Hymenophyllum*, *Eremopteris*, *Coniopteris*, *Steffensia*, *Trichomanides*.

Fronds petiolate, simple or divided, pinnate, bi-tri-pinnatifid. Pinnules connate or lobate. Lobes dentate or subdivided. Costa fine and delicate, often bifid or free at the top; veins diverging above, or produced to the sinus of the lobes or teeth. Venules either indistinct or only proceeding from the lower part of the secondary nerves.

### SPHENOPTERIS LOBIFOLIA (Morris).

Frond bipinnate; pinnæ, somewhat linear, elongate, alternate; pinnulæ membranous, those of the lower pinnæ equal, ovate oblong, contracted at the base, approximate, with three nearly equal rounded lobes on each side, and a terminal obtuse one; the veins proceeding into each lobe, divide near the mid rib, the upper one being furcate; the pinnulæ towards the apex of the frond are rather sharply three-lobed and decurrent, the veins becoming furcate in each lobe.

*Localities.*—TASMANIA—New Town, York Plains, Longford (?). N.S. WALES—Newcastle, Mulimbimba.

*References.*—Morris, Strezelecki's Phys. Descrip. N.S. Wales and V.D. Land, 1845, p. 246, t. 7, f. 3; M'Coy, Annals, Nat. Hist., 1847, xx., p. 149; ibid, Proc. Soc. V.D. Land, 1851, i., p. 306; Tenison-Woods, Proc. Lin. Soc. N.S. Wales, 1883, vol. viii., pt. 1, p. 88; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 100.

### SPHENOPTERIS ALATA (Brong.).

Frond tripinnate, rachis winged, pinnæ pinnate, above pinnatifid, with decurrent sessile pinnules, lower pinnatifid, with three to six bluntly toothed segments, upper ones inciso-dentate, veins either simple or forked, diverging slightly into each lobe from the costa at an acute angle.

*Localities.*—TASMANIA—New Town, Longford (?). N.S. WALES—Mulimbimba.

*References.*—Brongniart (*Pecopteris*), Hist. Vég. Foss., 1828, i., p. 361, t. 127; (*Sphenopteris* var. *exilis*) Morris, Strezelecki's Phys. Descrip. N.S. Wales and V.D. Land, 1845, p. 246, t. 7, f. 4; M'Coy, Annals Nat. Hist., 1847, xx., p. 149; ibid, Proc. R. Soc., V.D. Land, 1851, i., p. 306; Schimper Traité de Pal. Vég., 1869, i., p. 411; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. viii., pt. 1, p. 90; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 99.

### SPHENOPTERIS ELONGATA (Carr).

Frond dichotomously divided, each division irregularly pinnate; pinnæ simple, bi-furcate or irregularly pinnate; segments narrow, linear, slightly tapering upwards to the somewhat blunt apex, the costa sending out simple veins which run along the middle of each segment.

It is doubtful whether the Tasmanian variable form, the rhachis of which, sometimes scarcely a millimetre in width,

**is not specifically distinct from *S. elongata*. The former is very distantly and sparingly branched.**

*Localities.*—TASMANIA — New Town, Richmond, Spring Hill, Jerusalem, York Plains, Spring Bay, Mt. Nicholas (?). QUEENSLAND —Tivoli mines.

*References.*—Carruthers, Quart. Jour. Geol. Soc., 1872, XXVIII., p. 355, t. 27, f. 1; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 92; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 99.

### SPHENOPTERIS HASTATA (M'Coy).

*Sp. Char.*—**Bipinnate; pinnæ long, acutely lanceolate, with a broad alate margin; pinnules elliptical, obscurely undulato-dentate, having obsolete lobes on each side; nerves bipinnate, two branches reaching each lobe of the margin.**

*Localities.*—TASMANIA—Upper Coal Measures (Mesozoic), New Town (?). N.S. WALES—Mulimbimba.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 149, t. 10, f. 1; ibid, Proc. Roy. Soc., V.D Land, 1851, I. pp. 306-307, t. 10 f. 1; Schimper, Traité de Pal. Vég., 1869, I. p. 410; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, Vol. VIII., pt. I., p. 90; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 100.

### SPHENOPTERIS GERMANUS (M'Coy).

**Bipinnate; pinnæ oblique, alternate elongate, ovate, with a narrow membranous margin; pinnules oval, deeply pinnatifid; lobes very oblique, elliptical, generally three on each side, and the apex of the pinnules three lobed; nerves bipinnate, three branches reaching the margin of each lobe.**

*Localities.*—TASMANIA (?). N.S. WALES—Mulimbimba.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 150, t. 10, f. 2; ibid, Proc. R. Soc., V.D. Land, 1851, I, p. 307; Schimper, Traité de Pal. Vég., 1869, I., p. 411; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 91; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 100.

### SPHENOPTERIS PLUMOSA (M'Coy).

*Sp. Char.* — **Bipinnate; pinnæ curved, elongate, narrow, plumose, with a scarcely alate margin to the rachis; pinnules close, oblique, ovate, pointed, deeply cleft into about four oblique mucronate lobes on each side, exclusive of the largely trilobed apex; nerves strong, much branched, so that about six branches reach the margin of each of the lobes of the lower side, and seven to each of those of the upper margin.**

*Localities.* — TASMANIA — New Town (?). N. S. WALES — Mulimbimba. VICTORIA—Wild Dog Creek, Apollo Bay.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 150, t. 1, f. 3; ibid, Proc. R. Soc., V.D. Land, 1851, I., p. 307, t. 10, f. 3; Schimper, Traité de Pal. Vég., 1869, I., p. 411; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1., p. 91; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 100.

### SPHENOPTERIS FLEXUOSA (M'Coy).

*Sp. Char.*—Bipinnate; pinnæ very long, with a strongly flexuous naked rhachis; pinnules large, moderately oblique, unequal, ovate, sides cut into two very large obtusely rounded lobes on each side; apex trilobed; nerves strong, much branched, seven branches reaching the margin of each lateral lobe, and three going into each of the three lobes of the apex.

*Localities.*—TASMANIA—New Town (?). NEW SOUTH WALES—Mulimbimba.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 150, t. 9, f. 4; ibid Proc. R. Soc., V.D. Land, 1851, I., p. 307 t. 9., f. 4; Schimper Traité de Pal. Vég., 1869, I., p. 411; Tenison-Woods, Proc. Lin. Soc. N.S. Wales, 1883, vol. VIII., pt. 1, p. 91; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 99.

### TRICHOMANIDES. (Tenison-Woods, Proc. Lin. Soc., New South Wales, p. 94.)

Frond simple or divided, bi, or tri-pinnate, primary rachis narrow, or terete, sori unknown.

### TRICHOMANIDES, ETTINSHAUSENI. Nov. Sp.

Frond pinnate; (or bi-pinnate ?) pinnæ delicate, membranous narrow, with closely adpressed, simple distant alternate pinnules, similar in character to winged rhachis; pinnules simple, linear, sub-decurrent towards winged base, slightly diverging towards bluntly pointed apices. A simple nerve traverses branches and simple pinnule as in the existing *Hymenophyllum rarum* Br. Length of pinna, 3 inches; length of pinnules from junction of median nerve to apex, 15 millimetres; breadth of pinnule, 1½ millimetres.

This form is very distinct from *Sphenopteris elongata*, Carr., which also occurs in the Spring Hill beds, and with which it has some points of resemblance.

### RHACOPTERIS, SCHIMPER.

Frond pinnate, rachis rigid, grooved in the middle. Pinnæ elongate, broadly linear. Pinnules sub-horizontal, somewhat remote, contiguous or sub-imbricate, spreading, oblong rhomboidal, more or less deeply incised and flabellate; lobes narrow, straight or slightly removed.—*Obs.*—The incisions are in the direction of the veins, and each ligule comprises one or two branches. The name refers to the incision of the pinnules. The genus hitherto was supposed to be confined to the Devonian or Lower Carboniferous.

### RHACOPTERIS (?) FEISTMANTELII. Nov. Sp.

Frond coriaceous imparipinnate, handsome; rhachis strong; pinnæ sub-opposite, variable, distant, symmetrical or unsymmetrical, lingulate or obovate lanceolate, curved or spreading, greatly contracted at attachment to rhachis; terminal pinnule erect, inequilateral, with a rounded lobe on one side at base, somewhat falciform; apex generally more rounded than the terminations of lateral pinnæ; neuration parallel and crowded at contracted or petiolate attachment, thence gently spreading and forking, the lateral nerves, terminating in dentate or curiously recurved and variable laciniate segments, which are more strikingly developed at base of lateral pinnæ; the central nerves reach the extreme termination of pinnæ; nerves form a somewhat coarse linear grooving on surface of pinnæ, but do not anastamose. Not uncommon in shaly beds at Spring Hill, Tasmania.

I have placed this singularly handsome form under the genus Rhacopteris, although the form of its neuration is very suggestive of alliance with certain forms of Otozamites. See *O. imbricatus*, Feistm. The rhachis, though strong and rigid, with a broad shallow groove on one side, lacks the prominent mesial angle which characterises ***R. intermedia***, Feistm, and the more closely related ***R. septentrionalis***, Feistm. It almost invariably happens also that, unlike the latter, the most pronounced recurved segment is the lower one of any marginal group; the segments are smaller and finer as a rule towards the apex of each pinna where they usually are simply dentate. It is here again noteworthy that the European members of this singular genus is confined to the Devonian and Lower Carboniferous rocks, a fact which should not be overlooked in attempts made to correlate the widely separate groups of Upper Pal. and Mesozoic rocks of Australasia.

### R. INÆQUILATERA (Goeppert).

Frond upper side broadly rounded, truncate at the base at a right angle. Petiole, short, straight, decurrent. Veins united at the base, spreading widely and dichotomously divided.

*Localities.*—TASMANIA — (Not known. See *R. Feistmantelii*). N. S. WALES--Arowa, Smith's Creek.

*References.*—Goeppert (Cyclopteris), Flora, A. Silur-Devon., p. 72, Vol. XXXVII., pp. 6, 7, and 8; Tenison-Woods, Proc. Lin. Soc., N. S. Wales, 1883, Vol. VIII., pt. 1., p. 98; Feistmantel, Foss. Flora. of E. Austral. and Tasmania, Geol. Mag., Nov., 1879, p. 489.

### R. INTERMEDIA (Feistmantel).

Rhachis thick, with a prominent mesial angle, pinnules alternate, pedunculate, oblong, rhomboid, incised into cuneate segments, the centre longest, incisions scarcely marked above. Margins of the segments denticulate, veins numerous, forking, radiating in the segments. In the form of the rhachis this resembles very much ***R. transitionis*** and ***R. machanechi***, Stur.

*Localities.*—TASMANIA—(Not known. See *R. Feistmantelii*). N.S. WALES—Port Stephens (Stroud).

*References.*—Feistmantel, Pal. Berträge Cassel., 1878, pt. III., p. 75, t. 11 ; Tenison-Woods, Proc. Lin. Soc., N. S. Wales, 1883, Vol. VIII., p. 98 ; Feistmantel, Foss. Flora. of E. Austral. and Tasmania, Geol. Mag., Nov., 1879, p. 490.

### R. Septentrionalis (Feistmantel).

Rhachis as in the last species, pinnulæ sub-alternate, with short petioles, sub-erect, oblong near the rhachis, deeply lobed, and thence sub-flabelliform, lobes sub-rhomboid, deeply incised, segments rounded above. Veins indistinct.

*Localities.*—Tasmania—(Not known. See *R. Feistmantelii*). N.S. Wales—Smith's Creek (Stroud).

*References.*—Feistmantel, Pal. Berträge Cassel, 1878, pt. III., p. 147 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., p. 98.

### Cyclopteris (Brongniart).

Frond simple, pedicellate, flabelliform or reniform, symmetrical, membranaceous; margin sub-entire, crenulate or fringed; veins arising from the base, forking frequently, radiating, slender, all reaching the margin. (Tenison-Woods).

### Cyclopteris cuneata (Carruthers).

Form of the entire frond unknown; pinnæ entire, large cuneate, narrowed at the base, with the distal margins rounded; veins delicate, once or twice dichotomously divided, sometimes anastomosing once in their length in the middle of the pinnæ.

*Localities.*—Tasmania-Porter's Hill, Hobart (?).* Queensland—Tivoli Coal Mines.

*References.*—Carruthers, Quart. Journ. Geol. Soc., 1872, XXVIII. p. 355, t. 27, f. 5 ; Feistmantel Records Geol. Survey, India, 1876, IX., pt. 4, p. 123.

### Thinnfeldia (Ettingshausen).

Fronds pinnate, segments or pinnæ oblong, ovate lanceolate, decurrent, and confluent at the base, coriaceous ; costa divided into many veins, venules and veinlets, before reaching the apex ; veins emerging at a slight angle, diverging in ascending, and often forking, venules or veinlets reaching the margin. Stomata in both sides of the lobes. Obs.—The frond is generally dichotomous, and is with the leaves of a thick and fleshy habit. It belongs in Europe to the lower Lias and Rhaetic formations.

### Thinnfeldia (Pecopteris), Odontopteroides (Morris).

Frond pinnatifidly bipinnate, or flabellate (?) ; pinnæ, linear, elongate, acuminate; pinnulæ opposite, approximate, adnate, ovate obtuse, entire ; veins nearly obliterated.

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* May only be a curiously cut fragment of a species of *Gangamopteris.*

*Localities.*.— TASMANIA — Jerusalem, Whale's Head. NEW SOUTH WALES—Clark's Hill, Hawkesbury Sandstones. QUEENSLAND—Ipswich, Tivoli Mines.

*References.*—Morris. Strezelecki's Phys. Descrip. N.S. Wales and V.D. Land, 1845, p. 2, 49, t. 6, f. 2-4. M'Coy (Gleichenites) Annals Nat. Hist., 1847, XX., p. 147 ; Schimper, Traité de Pal. Vég., 1869, I., p. 488 ; Feistmantel, Records Geol. Survey, India, 1876, IX., pt. 4. pp. 123-124 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, vol. VIII., pt. 1, pp. 106-107 ; R. Etheridge, junr., Cat. Aust. Fossils, 1878, p. 98.

### THINNFELDIA ODONTOPTEROIDES (Morris).

### Var. *obtusifolia* (Johnston).

Frond bipinnate ; pinnæ simple or dichotomous ; rhachis strong and grooved, not winged ; pinnules sub-opposite scarcely oblique, connate at the base, obtuse, broader than long, lower ones frequently emarginate ; upper margin emerging obliquely or at right angles to rhachis and roundly tapering downward towards lower margin, adhering base broadest ; lower pinnules free and relatively more square, emarginate, and shorter than the somewhat continuous or pinnatifid segments at the extremities of pinnæ ; the two inner pinnules at base of furcate pinnæ are slightly imbricate ; pinnæ usually from three to five inches long, and from six to thirteen millimetres broad ; veins extremely fine, all arising from the rhachis, dichotomous, diverging as they ascend.

This fern is especially the characteristic form in certain shales at the foot of Spring Hill. From the extreme divergence of this form from the types figured originally by Professor Morris in Strezelecki's work (Physical Descrip., N.S.W., and Tas.), and from the frequency which the very fine venules ascend from the rhachis independently, I was at first inclined to regard it as a distinct species allied to *Odontopteris*, but the further study of Dr. Feistmantel's able investigations and of the fuller and more correct characters of the various forms given by him led me to abandon my original view, and refer the whole of the various forms at Spring Hill to *Thinnfeldia odontopteroides.* There is one beautifully preserved specimen, however, in my possession which from the delicacy and independence of the branching venules would almost justify its inclusion under the genus *Odontopteris.* This specimen particularly is almost identical in form with *O. Schlotheimii,* far more so, I believe, than the *O. microphylla,* M'Coy. The latter is found common in the fine sandstones of Clarke's Hill, N.S. Wales (Wianamatta beds). The shales at Spring Hill appear to be older than the eruptive greenstone forming the high ridge at that place. It is possible that the shales at Spring Hill, may belong to a formation distinct from the Jerusalem basin.

It is significant to find that all the associated plants at this place are new to Tasmania, viz., *Tæniopteris Tasmanica* mihi; *Rhacopteris Feistmantelii*, mihi; *Thinnfeldia media*, Woods closely resembling *T. indica*, *Sphenopteris elongata*, Carr. and a form having the characters of the genus *Trichomanides* (*T. Ettingshauseni*, mihi). The prevailing forms of the Tasmanian Coal Measures as represented at Jerusalem, New Town, Oatlands, Longford, Fingal, Ben Lomond, and Seymour, could not be traced among those mentioned.

The prevailing forms throughout the Upper Coal Measures are *Pecopteris Australis* (Mor); *Sphenopteris lobifolia* (Mor); *S. alata*, Br.; *S. plumosa*, Br.; *Zeugophyllites elongatus* (Mor); *Phyllotheca Australis*, Br.; *P. ramosa* (M'Coy); *P. Hookeri* (M'Coy).

### THINNFELDIA ODONTOPTEROIDES (Morris).

### Variety *superba* (Johnston).

Frond bipinnate, large and graceful; pinna forking, dichotomous, contained angle of fork 48 degrees; segments of pinnules invariably cleft close to rhachis leaving a continuous wing along the latter, against which the broad bases of the pinnules are attached; the pinnules below the fork are broader than long, squarish, and become increasingly obtusely lobed on the upper marginal shoulder, the lower margin becoming gently rounded, thence parallel, and close to upper margin of the subjacent pinnules, all of which usually run into rhachis wing at a right angle. Pinnules at and above fork gradually lose the squarish appearance, are variably curved, broadly lanceolate and spreading, length greater than breadth at base, frequently becoming simply lanceolate towards apex; inner pinnules of fork generally smaller. Neuration fine, and forking repeatedly as in *T. falcata* from which it only differs in having a winged rhachis and in being a very much larger form. Rhachis strong, grooved; extreme length of pinnules below fork, 11 millimetres; above fork, 39 millimetres; average breadth of pinnules below fork, 18 millimetres; above fork, 12 millimetres.

This magnificent form occurs in shales associated with the coal seam at Spring Bay where it is associated with *Sphenopteris elongata.* (Carr.) *P. caudatus*, mihi, and *P. trilobita*, mihi.

### THINNFELDIA TRILOBITA. (Nov. Sp.).

Frond bipinnate (?), pinnæ, linear elongate, dichotomously divided; pinnules pinnatfid, coriaceous, oblique, opposite trincately narrowly strap-shaped, invariably terminating in three variably shaped digits or lobes, the central one of which is usually the most prominent; veins obscure, not well defined. Adjacent margins of pinnules run closely parallel to each other, joining in a rounded sinus near to rhachis, giving to the latter the appearance of a broad marginal wing; rhachis strong and grooved; average breadth of of pinna, 15 millimetres; average length of pinnules, 9 millimetres; breadth, 4½ millimetres.

Associated with *T. superba* mihi, in shales beneath coal seam at Spring Bay.

### Thinnfeldia media (Tenison-Woods).

Frond pinnatifid or bipinnate (?) pinnæ nearly opposite, lanceolate, acuminate, on the margin sinuate, the lower ones shorter, the upper more or less nearly auricled, the lower ones more or less decurrent, the costa dividing into many veins; these veins are forked. Stalk thick, striated.

*Localities.*—Tasmania—Spring Hill, Spring Bay. Queensland—Dubbo.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., plate 6, fig. 1.

### Pecopterideæ.

Frond undivided, simple, or pinnate many times in a beautiful manner. Pinnules often entire, but here and there sub-divided, and with a dentate margin, base wholly adnate, rarely constricted, sometimes confluent. Costa persistent to the apex, pinnately ramose; veins dichotomous, diverging to the margin at a more or less open angle. Venules simple, forking twice or thrice, rarely anastomosing When sori are present they are marginal or disposed towards the middle of the pinnule, punctiform, oval or linear.

### Pecopteris (Brogniart).

Veins emerging from the costa in a more or less open angle, diverging arcuately, simple or dichotomous, venules often forked.

### Pecopteris (?) tenuifolia (M'Coy).

*Sp. Char.*—Bipinnatifid (?), pinnules and rhachis very slender, each about half a line wide; pinnules very long, oblique, linear, apparently simply united to the rhachis by their entire base, one very strong midrib running throughout; secondary nerves unknown.

*Localities.*—Tasmania (?). N.S. Wales—Clark's Hill.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 152, t. 9, f. 6; ibid, Proc. R. Soc., V.D. Land, 1851, 1 p. 308, t. 9, f. 6; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII, pt. 1, p. 110; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 98.

### Pecopteris caudata. Nov. Sp.

Frond bipinnate (?); pinnæ linear-lanceolate, pinnules connected, lobate or slightly pinnatifid from base to within an inch of apex, where the pinnæ terminate in a simple or confluent linear terminal pinnule; all lobes oblique, rounded, with margins rough or finely venulate; primary vein of each lobe emerging acutely from rhachis, from which radiate dichotomously numerous small venules which reach the margin; an occasional independent venule arises from rhachis towards sinus of each lobe.

Pinnæ or frond (?), imperfect 2¾ inches long. Breadth across middle of terminal pinnule, 5 millimetres. Breadth across base, 14 millimetres.

From greyish shale below 4 feet coal seam at Longford

This is probably a very variable species, as it corresponds in some respects with a protean form occurring in the shales associated with a similar coal seam at Spring Bay and at York Plains. There are certain characters which link this form with the genus *Odontopteris*, but until more perfect specimens are obtained, it is referred by me provisionally to the genus *Pecopteris*. The veins are invariably strong and prominent, very unlike the fine neuration of *Thinnfeldia Odontopteroides* (Morris).

### ALETHOPTERIS (PECOPTERIS), AUSTRALIS. Morris.

Frond bipinnate; pinnæ oblique, alternate, rather distant; pinnulæ thin falcate and rather obtuse, oblique and somewhat incurved, more or less adnate to the rhachis, and sometimes decurrent, dilate at the base, or auriculate; midrib slightly flexuous, evanescing towards the apex; veins oblique, bifurcate, or dichotomous.

*Localities.* — TASMANIA — New Town, Hamilton, Richmond, Jerusalem, Spring Bay, Impression Bay, York Plains, Longford, Ben Lomond, Seymour. VICTORIA—Bellarine.—N.S. WALES—Clarence River. QUEENSLAND—Ipswich, Darling Downs.

*References.*—Morris, Strezelecki's Phys. Descrip. N.S. Wales and V.D. Land, 1845, p. 248, t. 7, f. 1 and 2; M'Coy, Annals. Nat Hist., 1862, IX., p. 143; ibid, Geol. Survey, Vic., Dec. 1, 1874, p. 34; Schimper, Traité de Pal. Veg., 1869, I. p. 569; Feistmantel, Records, Geol. Survey India, IX., pt. 4, p. 123; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pp. 111-112; R. Etheridge jun., Cat. Aust. Fossils, 1878, p. 97.

### TÆNIOPTERIDÆ.

Fronds stipitate, simple, oblong, lanceolate, and broadly elongate, entire or pinnate; pinnæ linear, lingulate, more or less acuminate, shortly pedicellate or sessile. Rhachis and costa conspicuous; veins emerging at an acute angle, but immediately becoming horizontal or oblique, simple and dichotomous. Sori transversely oblong, sub-marginal or rounded, and scattered over all the lower part of the surface, or in series along the venules.

### TÆNIOPTERIS (Brongniart).

Frond simple, and in habit like *Scolopendron*. Costa conspicuous above, sub-terete underneath; veins generally conspicuous, slender, numerous, and close, dichotomous a little above the base; venules simple or dichotomous, parallel, with an occasional intermixture of simple nerves.

### Tæniopteris Tasmanica. Nov. Sp.

Frond simple, broadly strap-shaped, not obovate; midrib moderately strong; veins well defined, exceedingly close and numerous, parallel, emerging from midrib at an acute angle, and immediately bending and reaching margin at a slight angle upwards. About one nerve in ten simply furcate near middle of wing; about 24 nerves in the space of half-an-inch. Length unknown. Breadth, about 46 millimetres, Common in the shales at foot of Spring Hill. This form approaches *Macrotæniopteris Wianamatta* (Feistm.) of the Hawkesbury sandstone, but seems to differ from the latter by its closer neuration and its broadly strap-shaped form. It also approaches *T. densinervis* (Feistm.), from Kukurbit, India, but it would appear that the latter differs in having the nerves more delicate if not more dense, and in being more frequently furcate.

### Tæniopteris Morrisiana. Nov. Sp.

Frond simple, narrowly strap-shaped; costa fine; veins numerous, parallel, one in six simply furcate, emerging and radiating outwards at a moderately acute angle to margin. Length, unknown; breadth about 16 millimetres; nerves fully 1 millimetre apart.

Occurs in a greyish white shale below 4 feet coal seam belonging to Mr. Mason near Longford. Associated with *Zeugophyllites elongatus* (Mor.), and *Alethopteris Australis* (Mor.).

*T. Morrisiana* is a very distinct form from *T. Daintreei* (M'Coy). It approaches *Oleandridium vittatum* (Brgt.) far more closely. It differs from the latter in the less frequent furcation of the nerves and in the delicacy of its midrib, *O. vittatum* being very strong comparatively. It is more closely allied to the example figured as *T. Daintreei*, by Mr. Carruthers (Quart. Jour. Geol. Soc. London, 1872, Pl. XXVII. fig. 1), but, which I consider, with Prof. M'Coy (p. 16, Decade. Prod. of Pal. of Victoria, Pl. XIV., fig. 1), to be a very distinct species. See *T. Carruthersii*, Tenison-Woods, Proc. Lin. Soc., 1883, Vol. VIII, p. 117.

### Tæniopteris Daintreei (M'Coy).

Frond very long, linear, parallel sided; substance thick, edges straight, costa very strong; veins extending at right angles from the midrib to the lateral margins, a few straight and simple, the greater number once forked at a variable distance between the midrib and

**lateral margin; total width of frond four lines, about ten or eleven lateral veins in the space of two lines at the margin, both of ordinary specimens, four lines wide, and one specimen nearly two inches long, but only one and a half lines wide throughout.**

*Localities.*—TASMANIA. Referred to by M'Coy (Dec. 2, Pal. Vic., p. 15), as occurring "in the same mass of stone with *Glossopteris Browniana*, in one of the Tasmanian specimens," therefore locality probably Mersey Coal Basin (?). N.S. WALES—M'Coy. VICTORIA.—Bellarine, Barabool Hills, Cape Paterson, Strezelecki Range, Murundal. QUEENSLAND.—Tivoli Mines (?).

*References.*—M'Coy, Trans. Roy. Soc. Vic., 1860, V., pp. 196 and 215; ibid, Dec. II., Pal. of Vic., p. 15, pl. 14, f. 1-2; Carruthers, Quart. Journ., Geol. Soc., 1872, XXVIII., p. 355, t. 27, f. 6 (?); Feistmantel, Geol. Survey, India, IX., pl. 4, pp. 123-124; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII. (T. Carruthersii, Woods), p. 117; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 100.

### *Sub-Order.*—DICTYOPTERIDEÆ †

Nerves *reticulate*, fronds many times pinnate or pinnatifid †

*A.* With a midrib.
  *a.* Costa conspicuous, frond simple. *Glossopteris.*
  *b.* Costa inconspicuous, except in the middle, frond quadrilobate. *Sagenopteris.*
*B.* Without a costa. *Gangamopteris.*

### GLOSSOPTERIS (Brongniart).

Frond simple, elongately elliptical, acuminate, entire, coriaceous, petiolate, rhachis broad, gradually tapering up to the apex. Veins emerging from the rhachis at an acute angle, from which, to the middle of the leaf, they form a hexagonally rhomboid net, thence to the edge somewhat more free, dichotomous, not so often anastomising, and forming very large rhomboidal areolæ. Sori rounded.

### GLOSSOPTERIS BROWNIANA (Brongniart).

Frond simple, spathulate, or oblong, lanceolate, entire, attenuate at the base; costa thick, canaliculate, gradually contracting towards the apex; veins oblique, anastomosing, hexagonal near the rhachis and elongate near the edge.

*Localities.* — TASMANIA — Lower Coal Measures (Up. Pal.), Mersey, Southport (Wintle), Lower Tamar (Wintle). N.S. WALES —Newcastle, Jerry's Plain, Mulimbimba, Illawara.

*References.* — Brongniart, Prodrome, 1828, p. 54; Morris, Strezelecki's Phys. Descrip., N.S. Wales and V.D. Land, 1845, p 247, t. 1, f. 1; Schimper, Traité de Pal. Vég, 1869, p. 645; Carruther's Quart. Journ. Geol. Soc., 1872, XXVIII., p. 354; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII, pp. 122-123; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 96.

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† In Schimper and Zittel's Paleontologie this is only a sub-order of Tæniopterideæ.

GLOSSOPTERIS BROWNIANA, Var. PRÆCURSOR (Feistmantel).

Leaves small, long, spathulate; costa distinct, fading away towards the apex; veins emerging at an acute angle, curved, forked, anastomosing, forming a sub-equal elongate, polygonal network.

*Localities.*--N.S. WALES – Stony Creek.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII, pt. 1, p. 126.

GLOSSOPTERIS LINEARIS (M'Coy).

Leaves very long, narrow, with nearly parallel sides; midrib very large; secondary veins fine, forming an angle of about 50deg. with the midrib, anastomising occasionally from the midrib to the margin.

*Localities.*— TASMANIA — Mount Nicholas (Killymoon Coal Seam ? ). N.S. WALES—Woollongong, Arowa.

*References.*—M'Coy, Annals Nat. Hist., 1847, XX., p. 151, t. 9, f. 5; ibid, Proc. R. Soc. V.D. Land, 1851, I., p. 308, t. 9, f. 5 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 97 ; Tenison-Woods Proc. Lin. Soc. N.S. Wales, 1883, vol. VIII., p. 123.

GLOSSOPTERIS AMPLA (Dana).

Frond very large, widely ovate, entire, undulating, obtusely acuminate ; costa thick, extending to the apex; veins extremely fine and close, leaving long, narrow reticulations, which are longest towards the margin.

*Localities.*—TASMANIA—Porter's Hill, Hobart (?). Mersey (?). N.S. WALES—Newcastle, Illawara.

*References.*—Dana, Geol. U.S. Expl. Expd., 717, Atlas, t. 13, f. 1; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. VIII. pt. 1, p. 124 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 976.

GLOSSOPTERIS RETICULATA (Dana).

Frond large, oblong-elliptical, the width not exceeding a third part of the length, gradually attenuate towards the apex; veins broadly reticulate to the margin. Considered to be a variety of *G. ampla* by Feistmantel.

*Localities.*—N.S. WALES— Newcastle, Illawara (Rare).

*References.*—Dana, Geol. U.S., Expl. Expd., p. 717, Atlas, t. 13, f. 1 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. VIII, pt. 1, p. 124 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 976.

GLOSSOPTERIS ELONGATA (Dana).

Frond narrowly elongate, lanceolate, attenuate at the base; costa somewhat thick, distinct ; veins neatly reticulate. Considered to be a variety of *G. ampla* by Feistmantel.

*Localities.*—N.S. WALES—Newcastle.

*References.*—Dana, Geol. U.S. Expl. Expd., p. 718, Atlas, t. 13, f. 5 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. VIII, pt. 1, p. 124 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 96.

### GLOSSOPTERIS CORDATA (Dana).

Frond distinctly cordate towards the base ; lobes rounded; costa thick ; veins reversed at the base, diverging from the costa, neatly reticulate, with narrow, oblong interspaces. Considered to be a variety of *G. ampla*, by Feistmantel.

*Localities.*—N.S. WALES—Illawara.

*References.*—Dana, Geol. U.S., Expl. Expd., p. 718, Atlas, t. 13, f. 5 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. VIII., pt. 1, p. 124 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 96.

### GLOSSOPTERIS TÆNIOPTEROIDES (Feistmantel).

Frond simple, elegant in form, oblong, ovato-spathulate, attenuate at the base ; costa valid, striate or grooved. Veins emerging at nearly a right angle, giving at first sight the appearance of a *Tæniopteris*. Under the lens the venation is seen to form an oblong, narrow, obliquely acute parallel network which is sometimes indistinctly polygonal. The costa is stiff and straight. Only one specimen was known to Dr. Feistmantel, which came from Blackman's Swamp Coal Beds.

*Localities.*—N.S. WALES—Blackman's Swamp Coal Beds.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, vol. VIII., p. 125.

### GLOSSOPTERIS WILKINSONI (Feistmantel).

Frond extremely narrow, sub-parallel, strap-shaped, costa distinct, produced at the apex ; veins sub-horizontal, dichotomous, anastomosing usually once near the apex, forming an oblong network, with a few smaller meshes towards the margin of the rhachis.

*Localities.*—N.S. WALES—Blackman's Swamp.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., p. 125.

### GLOSSOPTERIS PARALLELA (Feistmantel).

Frond very long, simple, elongately ovate, apex unknown ; costa distinct, grooved in the middle. Veins emerging at an angle of 30 deg., in the lower portion, and at an angle of 20 deg. in the upper portion of the frond, dichotomous parallel, but anastomosing, forming a distinct oblong polygonal net, which is narrower towards the margin.

*Localities.*—N.S. WALES————(?)

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., p. 125.

### GLOSSOPTERIS ELEGANS (Feistmantel).

Frond of medium size, oblong spathulate, with a costa which becomes merged in the tissue above ; below it is formed of pairs of areola spaces, which are oblong ; above these are similar spaces, but shorter and somewhat polygonal. Veins arising at an acute angle from the medium areolar spaces, dichotomous, anastomosing, and forming an oblong network.

*Localities.*—N.S. Wales—Greta.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, pp. 125-126.

### Glossopteris primœva (Feistmantel).

Frond spathulate, costa thick, grooved veins, emerging at an angle of from 20 to 30 deg., parallel, dichotomous, anastomosing, forming a polygonal network, which is wider and shorter near the rhachis, narrower and longer near the margin.

*Localities.*—N.S. Wales—Greta. India—Damuda.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883. vol. VIII., pt. 1, p. 126.

### Glossopteris Clarkei (Feistmantel).

Leaves oblong ovate, obtusely acuminate; costa distinct, grooved in the middle. Veins parallel, dichotomous, free for the greater part of the leaf, like a *Tœniopteris*, anastomosing only at the margin, twice or thrice forming a rhombo-polygonal network.

*Localities.*—N.S. Wales. ——————(?)

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 126.

### Gangamopteris (M'Coy).

Frond simple or impari-pinnate; middle pinnæ spathulate, symmetrical, semi-elliptically pointed above, gradually tapering towards the base; lateral pinnæ variable, very acute, tapering from base or obliquely ovate, to trigonal or flabelliform, broad above, gradually narrowed towards the oblique adherent base, which is never auriculate, but moderately wide and embracing no costa; veins coarsely reticulate, many arising from the base, branching as they diverge towards the margin and frequently anastomosing to form an irregular polygonal network.

### Gangamopteris spathulata (M'Coy).

Spathulate, symmetrical, equal sided, semi-elliptically pointed above, tapering towards the base to a slender petiole; length 4½ inches, width about 1½ to 2 inches. (This is the rarest of the three forms in the Bacchus Marsh sandstones, M'Coy.)

*Localities.*—Tasanmia—Mersey. Victoria—Bacchus Marsh.

*References.*—M'Coy, Geol. Survey, Vic., Dec., II., 1875, p. 12, t. 13, f. 1; Feistmantel, Records, Geol. Survey, India, 1876, IX., pt. 4, p. 123; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII, pt. 1, p. 127.

### Gangamopteris obliqua (M'Coy).

Frond wide, inequilateral, oblique, sub-trigonal, widest near the broadly rounded distal end, gradually tapering towards the base, which is not petiolate, but obliquely truncated, with a moderately wide sessile base of attachment. Length, commonly about four or five inches; width near apex, about three and a half inches; width near base, commonly about nine lines.

*Localities.*—TASMANIA—Mersey. VICTORIA—Bacchus Marsh.

*References.*—M'Coy, Geol. Survey, Vic., Dec. II., 1875, p. 13, t. 12, f. 2-4; Feistmantel Records, Geol. Survey, India, 1876, IX., pt. 4, p. 123; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 127; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 96.

### GANGAMOPTERIS ANGUSTIFOLIA (McCoy).

Leaf linear, lanceolate, eight or nine times longer than wide; side straight, nearly parellel, pointed above, contracted to a lengthened petiole below; nerves equal, those of the middle third of the frond nearly parallel, straight rather closer than those of the sides, which gradually divaricate towards the margin at a very acute angle; all the nerves dichotomise at irregular intervals, and those of the sides occasionally anastomose and are connected by a few transverse bars.

*Localities.*—TASMANIA—Upper Marine Beds, Mersey. N. S. WALES—Guntawang, Newcastle. VICTORIA—Bacchus Marsh.

*References.*—McCoy (*Cyclopteris*), Annals Nat. Hist., 1847, XX., p. 148, t. 9. f. 3; ibid, Proc. Roy. Soc., V.D. Land, 1851, I., p. 306, t. 9. f. 3; Feistmantel, Rec. Geol. Survey, India, 1876, IX., pt. 4., p. 123; Tenison-Woods, Proc. Lin. Soc., 1883, Vol. VIII., pt. 1., p. 127; R. Etheridge, junr., Cat. Aust. Fossils, 1878, p. 95.

### GANGAMOPTERIS CLARKEANA (Feistmantel).

Frond spathulately rounded, of medium size, coriaceous, entire, symmetrical, rounded above but greatly attenuated towards the base, whence the somewhat thick and distant veins radiate, forking and forming an oblong network. Resembles *G. spathulata.*

*Localities.*—N.S. WALES—Bowenfels.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, pp. 127-128.

### SAGENOPTERIS (Presl.).

Frond quadri-lobate arising from a terete stipe, lobes free to the base, articulate, deciduous, extremely variable even in the same frond, being hastate cultriform, rhomboidal, oblong, lanceolate, and unsymmetrical, coriaceous, thickened at the articulation. Costa immersed in the tissue at the base, but distinct towards the middle; veins arising at an acute angle, but diverging in ascending, anastomosing, forming a hexagonal rhomboidal network. Epidermis unequally rectangular above, polygonally areolate below, and pierced with stomata.

### SAGENOPTERIS RHOIFOLIA (Presl.).

Frond very variable both as to the shape and size. Pinnæ narrow at the base, articulate, spathulate, obovate, or oblong acuminate, rarely oblong lanceolate or sub-rotundate, inequilateral, very rarely sub-symmetrical, the middle leaves larger than the lateral ones, and quite entire. Ordinary length about 32 millimetres, with a diameter of 16 millimetres. The internal margins of the lateral fronds somewhat expanded, furnished here and there with a broad indistinct dental lobe.

*Localities.*—Queensland—Ipswich, Darling Downs.

*References.*—Presl. in Sternberg, Vol. I., p. 640, tab. XLIV., fig. 2-8 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 128.

### Sagenopteris Tasmanica (Feistmantel).

Frond compound digitate (?), with linear lobes, attenuate at the apex; costa distinct and rounded, veins emerging at an acute angle, forked, and once (so it seems in the fragments) anastomosing. A doubtful species resembling *S. Phillipsi*, Lindley and Hutton of the English Oolite.

*Localities.*—Tasmania—Jerusalem Basin.

*References.*—Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 129.

### Jeanpaulia (Unger).

Fronds coriaceous, arising from a cylindrical stem, flabelliform; segments, which are linear, forking repeatedly, entire, more or less elongate. Veins numerous, rather prominent, equal, parallel, dichotomous with the divisions of the frond. Superior epidermis formed of elongate rectangular or oblique cells; lower side of hexagonal cells with an undulating margin, and numerous stomata. Fruit, ovate-pisiform.

### Jeanpaulia bidens (Tenison-Woods).

Frond broadly flabellate; segments somewhat short, often becoming broader towards the apex, and ending in a short wide bifurcation, or in a curved falcate, acute or acuminate point. Veins not conspicuous, numerous (6 to 10), parallel, not branching. The longest of the segments in the specimen figured is 55 millimetre, and the width is from 3 to 6 millimetre.

*Localities.*—Queensland—Burnett River Coal Seams.

*References.*—Tenison-Woods, Proc. Lin Soc., N.S. Wales, 1883, vol. VIII., pt. 1, p. 132.

### *Order.* Lycopodiaceæ.

Stem or rhizome bearing true leaves, either linear, or small and one-nerved, or reduced to minute scales. Spore-cases solitary or few together, sessile in the axils of the leaves or of the bracts of a terminal spike, either all similar or of two kinds, larger ones *macro-sporangia*, containing a few larger spores or *macrospores*, and smaller *micro-sporangia*, containing numerous smaller often microscopic *microspores*, the differences now generally admitted to be sexual.

## LYCOPODIUM.

Stems leafy, hard, branching, creeping, prostrate, or erect. Leaves small, entire or minutely serrate, inserted all round the stem, usually in 4 rows. Spore cases all of one kind, flattened, one-celled, two-valved, sessile in the axils of the upper leaves, or of bracts usually smaller or broader than the stem leaves, and forming terminal or lateral spikes. Spores all minute and powdery.

### TASMANITES PUNCTATUS (Newton).

Bituminous discs (Sporangia) minute, rounded, usually flattened. Surface under microscope ornamented with minute crateriform rings, in the centre of each of which occurs a fine pore or tube communicating between the internal and external surface. These tubes are generally filled with blackish matter, and appear through the transparent coating of sporangium wall as hairs. The peculiar nature of this organism and its ornamentation was first described by the author in "Memoranda to Tasmanian Botanists" (p. 53), published in August, 1874, where it is described as "the spore-cases of some ancient tree allied to the existing club moss family." Forms the bituminous matter of the shale of the Lower Coal Measures of the Mersey, known as ***Tasmanite, Yellow Coal***, or ***Dysodile***.

*References.—Johnston* Mem. Tas. Botanists, 1874, p. 53 ; *Newton* Geol. Mag, 1875, Dec., 5, II., pp. 337-342, t. 10, f. 1-9 ; *Johnston* pamphlet on Tasmanite, or Mersey Yellow Coal, Hobart, 1877, p. 6, *T. Australis* ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 199.

### LEPIDODENDRON (Sternberg).

Large trees with dichotomous branches, surface closely covered with alternately arranged rhombic scars, having a vascular cicatrix near the middle or upper angle. Leaves linear, or peltate, fruit a strobilus or cone at the extremity of certain branches.

### *Sub-Genus.* BERGERIA (Presl.).

Scars nearly flat, obovate, rhomboic or quadrate, with a very small oval vascular cicatrix near the upper angle.

This genus belongs to the Paleozoic rocks, and various portions of the same plant have been formed into ***Stigmaria*** (roots), ***Lepidostrobus*** (cones or fruit spikes), ***Sigillaria*** (fluted trunks of some species), ***Cyperites*** (foliage), ***Knorria*** (casts of stems), ***Sternbergia*** (pith) and other genera.

### LEPIDOSTROBUS.

Cylindrical cones composed of winged scales, their axis traversed by a longitudinal cavity or receptacle, and terminating in rhomboidal disks, imbricated from above downwards.

### LEPIDOSTROBUS MUELLERI (Johnston).

Strobilus or cone imperfect, oblong, narrow, clyindrical, 4$\frac{1}{4}$ inches long, and $\frac{7}{8}$inches in diameter; the longitudinal, striated cylindrical core of specimen about half an inch in diameter, indicates that the central longitudinal cavity or core occupied fully one third of the total diameter; bractæ emerging from central axis at a slight descending angle, about 20 in number, from 4 to 6 millimetres thick at base, and tapering downwards to margin, where they are from 2 to 3 milimetres thick, and from which they suddenly bend upwards, and form long, thin, leaf-like imbricating bracts enclosing sporangia cavities or cells, of similar appearance and size to the enclosing bracteæ

This unique and interesting specimen was discovered by the author in the so-called auriferous sandstones of Campania, which belong to the Mesozoic Coal measures of Jerusalem.

The sandstones are intimately related with shaly beds replete with impressions of Phyllotheca Australis, P. Hookeri and Zeugophyllites elongatus.

Unfortunately the specimen soon after its discovery disappeared mysteriously from the Royal Society's Museum, Hobart, where it was temporarily deposited. Fortunately a careful drawing was taken by the author at the time when it was discovered. In the Royal Society's Museum, Hobart, there is a fragment of what appears to be a trunk of a species of *Knorria*. The locality cannot now be ascertained, but from the character of associated shales, it is probable that it came from the Jerusalem Basin. If so, there is a likelihood that it may be related to the strobilus *L. muelleri.*

*Locality.*—TASMANIA—Campania sandstones.

*Reference.*—Johnston, Proc. Roy. Soc., Tasmania, 1884, p. 225, fig. 1.

### LEPIDODENDRON (BERGERIA) AUSTRALIS (M'Coy).

Stem about two inches in diameter, having rhombic scars, with straight thick boundaries, about four inches long, and three and a half inches wide, with a very small oval, rounded, vascular, cicatrix, rarely near the middle or more usually eccentric towards the upper angle, and often connected with the appearance of a vertical shallow rounded sulcus; branches one inch in diameter having similar scars three lines long, and two and a half lines wide, upper and lower angles of the scars usually slightly more acute that the lateral ones, very rarely the lateral ones more acute.

*Locality.*—VICTORIA—Avon River Sandstones, Gippsland.

*References.*— M'Coy Annals Nat. Hist., 1862, IX., p. 141; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 134; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 31.

### LEPIDODENDRON NOTHUM (Unger).

Scars of the leaf contiguous, rhombic, with a single and generally central vascular scar; leaves small, peltate and imbricate, on long slender petioles, fruit produced on the apices of the thick branches, a single sporangium, almost sessile, borne on the middle of the petiole of the leaf, roots stigmarioid.

*Localities.*—N.S. WALES—Cowra, Canowindra, Goonoo-Goonoo Creek. QUEENSLAND—Mount Wyatt, Drummond Range, Ryedale, Mount Lambie.

*References.*—Unger, Deuksch K. Akad, Wien, 1856, XI., p. 175, t. 10, f. 4-8; Carruthers, Quart. Jour. Geol. Soc., 1872, XXVIII, pp. 350, 353, t. 26, f. 1-5, f. 7-14; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 135; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 31.

### LEPIDODENDRON VELTHEIMIANUM (Sternberg).

*Localities.*—EUROPE—Silesia, Hartz Mountains, Upper Vosges. AUSTRALIA— ——— (?).

*References.*—R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 31; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII., pt. 1, p. 136. See also *L. rimosum* (Sternberg), ibid.

### *Order.*—CYCADEÆ.

Flowers unisexual, without any perianth. Male flowers forming catkins or cones, consisting of numerous spirally arranged imbricated scales (or stamens), more or less cuneate, bearing on the concealed portion of their under surface, numerous sessile or rarely stipitate anther-cells, each opening in two valves, the upper imbricated exposed part of the scales hardened, and often much thickened, the apex truncate or more or less produced into an incurved or recurved point or lanceolate appendix. Female cones consisting of numerous scales, imbricate at least when young, either with one pendulous ovule (or carpel) on each side of the thickened and hardened apex, or with three or more erect ovules (or carpels) in marginal notches below the flattened acuminate, and usually dentate or pinnatifid apex. Fruiting-cone enlarged, and either remaining imbricate with two pendulous seeds to each scale, or the scales with marginal seeds spreading as the central shoot is developed within the cone. Seeds naked (or nuts) with a thick or hard outer coating or integument, and a fleshy albumen in a central cavity of which the straight embryo is suspended by a long folded cord. Cotyledons two, undivided. Palm-like plants, with a thick globose, and underground or erect and cylindrical woody stem, simple or rarely slightly branched, marked with the scars or bases of the old leaves. Leaves forming a crown at the apex of the stem, once or twice pinnate. Cones sessile or very shortly pedunculate, within the crown of leaves.

### ZAMITES (Brongniart).

(As amended by Schimper including *Zamia* and *Zamites* of Brongniart in part and *Crossozamia* of Powell.)

Leaves very variable in size and shape, either ovate oblong acuminate, or oblong or linear and oblong acuminate; all regularly pinnate. Pinnæ more or less horizontal and inserted perpendicularly into the rhachis, lanceolate, linear lanceolate, oblong, acuminate or obtuse, base contracting suddenly and fixed to the anterior side of the rhachis by a more or less distinct callosity; solidly coriaceous. Nerves distinct, straight, parallel, ending abruptly at the apical margin of the leaflet.

### PODOZAMITES (Fr. Braun.).

Leaves of medium size. Leaflets distinct, spreading, oblong, ovate, and linear oblong, apex obtusely acuminate or rounded, gradually narrowed towards the base, sub-pedicellate, pedicel articulate, deciduous. Nerves dichotomous at the very base, then simple, erect, parallel, then converging towards the apex.

*P. Barkleyi*, M‘Coy, *Victoria* — Queenscliff (Ten.-Woods, l.c., p. 144).

*P. ellipticus*, M‘Coy (Ten.-Woods, l.c., p. 144).

*P. longifolius*, M‘Coy, *Victoria*—Bellarine (Ten.-Woods, l.c., p. 145).

*P. lanceolatus*, Lindley and Hutton, *Queensland*—Ipswich (Ten.-Woods, l.c., p. 146).

### OTOZAMITES (Fr. Braun).

(*Odontopteris*, Sternb. Goeppert, Unger, in part. *Otopteris*, Lindley and Hutton, Schenk.)

Leaves moderately large, rarely very large, regularly pinnate, elongately linear, narrowed at each end, leaflets, densely close or more or less remote, alternate or linear lanceolate, obovate rhomboid or sub-circular, base suddenly narrowed, obliquely inserted on the upper side of the sub-terete rhachis, unequally auriculate, upper auricle smaller than the lower one, and adpressed to the rhachis. Nerves radiating from the insertion of the leaflet, basilar arcuate, the others sub-arcuate, once or more dichotomous. Epidermis with elongate deeply sinuous cellules.

*O. Mandeslohi.*— Kurr. Talgai Diggings, Queensland (Tenison-Woods, l.c., p. 151).

### ZEUGOPHYLLITES (Brongniart).

Fronds (?) petiolate, pinnate, opposite (?) oblong, nerves valid few, equal, becoming confluent at the base and apex.

### Z. ELONGATUS (Morris).

Stem (?) leaves petiolate, oblong elongate, entire truncate, and slightly thickened at the base; veins distinct, equal, parallel.

*Localities.*— TASMANIA — New Town, Richmond, Jerusalem, Impression Bay, Seymour, Ben Lomond, York Plains, Longford, Hamilton. N.S. WALES—Mulimbimba (?).

*References.*—Morris, Strezelicki's Phys. Descrip. N.S. Wales and V.D. Land, 1845, p. 250, t. 6, f. 5, 5a; M'Coy Annals. Nat. Hist., 1847, XX., p. 152; ibid Proc. R. Soc., V.D. Land, 1851, 1, p. 309; Tenison-Woods, Proc. Lin., N.S. Wales, 1883, Vol. VIII., pt. 1, pp. 151-152; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 101.

### NŒGGERATHIOPSIS (Feistmantel).

Leaves unknown, leaflets (pinnules) wedge-shaped from the base, or elongate-spathulate, sub-rhomboid or obovate, margins straight or incurved; nerves close and numerous, somewhat thick at the base, and from thence forking twice or oftener, becoming slender and diverging into the leaf.

### NŒGGERATHIOPSIS SPATHULATA (Dana).

Leaves short, spathulate, apex triangular and sub-acute, narrowed at the base, and thence gradually dilating; nerves very delicate, and only partially distinct, four or five veins in the breadth of a line.

*Localities.*—N.S. WALES———— (?). TASMANIA (?).

*References.*—Tenison-Woods, l.c., p. 153.

### NŒGGERATHIOPSIS MEDIA (Dana).

Elongate, lanceolate, tapering towards the base, and broadest within an inch of the apex. Extremity sub-triangular, and apex rounded. Veins a little divergent, about fifteen to half an inch. One leaf five inches long, about an inch wide within an inch of the apex, and a fourth of an inch at base; another shorter.

*Localities.*—TASMANIA — Mersey Coal Basin. N.S. WALES—Newcastle.

*References*—Tenison-Woods, l.c., p. 154.

### NŒGGERATHIOPSIS ELONGATA.

This is a doubtful species, which Dana identified with *Zeugophyllites elongatus* Morris, but says that it was found at Newcastle, which is clearly an error. He says that it may be identical with Goeppert's *N. distans*, but that plant grew in clusters, and, moreover, had veins bi-furcating in the middle, which does not occur in Morris's fossil. (Tenison-Woods).

*Locality.*—N.S. WALES—Newcastle.

*References.*—Tenison-Woods, l.c., p. 154.

### NŒGGERATHIOPSIS PRISCA (Feistmantel).

Leaves unkown, leaflets (pinnules) medium-sized, sub-rhomboid, obovate, slightly inequilateral, nerves close and fine, emerging radiately from a narrow base, and forking twice or thrice.

Greta Creek, N.S.W., under the marine Paleozoic fossiliferous strata. (Tenison-Woods, l.c., p. 154).

### CORDAITES (Unger).

Stem, a simple woody cylinder without medullary rays, but composed of radiating scalariform vessels, encircling a large pith with transverse lamellar partitions. Bark marked with leaf-scars. Leaves simple, sessile, very long, flat, parallel-sided, with broad clasping base, easily disarticulated from the stem, no midrib, but fine parallel neuration.

### CORDAITES AUSTRALIS (M'Coy).

Leaves several inches long, thick, flattened, parallel-sided, with unequal, longitudinal, simple parallel striæ; clasping base, slightly widened and bent a little downwards. Leaves at one inch from the base, about four or five lines wide; base about two to three lines wider.

*Localities.*—TASMANIA—Mersey Basin (?). VICTORIA—Upper Devonian Flags, Iguana Creek. QUEENSLAND—Gympie, Drummond Range. N.S. WALES—Mulimbimba.

*References.*—M'Coy, Geol. Survey, Vic., Dec., IV., 1876, p. 22, t. 36, f. 6-7 ; Tenison-Woods, Proc. Lin. Soc., N.S. Wales, 1883, Vol. VIII, pt. 1, p. 155 ; R. Etheridge, jun., Cat. Aust. Fossils, 1878, p. 30.

### *Class.*—CONIFERÆ.

Trees or shrubs, mostly with resinous secretions, the leaves are stiff, sometimes linear or needle-like, sometimes short and scale-like, or more rarely broad-lobed, or divided. The flowers are unisexual, either in cylindrical or short catkins, with closely packed scales, or the females are solitary. There is no perianth. The stamens in the males are either inserted on the axis of the catkin under the scales or the anther-cells are sessile, on the inside of the scales themselves, which then form part of the stamens. The ovules and seeds are naked, that is without ovary style or pericarp, although sometimes more or less enclosed in two bracts, or in a fleshy or hardened disk. The seeds are albuminous with one, or sometimes several embryos in the centres, each embryo having sometimes more than two cotyledons. (Tenison-Woods).

*Localities.*—TASMANIA—Upper Coal Measures and Lower Coal Measures, silicified trunks abundant. See also :—

*Taxites medius*, Tenison-Woods (ibid, l.c., p. 160, Queensland).

*Sequoites (?) Australis*, Tenison-Woods (ibid, l.c., p. 162, Queensland).

*Walchia Milneana*, Tenison-Woods (ibid, l.c., p. 163, Queensland).

*Cunninghamites Australis*, Tenison-Woods (ibid, l.c., p. 165, Queensland).

*Aracaurites polycarpa*, Tenison-Woods (ibid, l.c., p. 165, Queensland).

# REMARKS ON TIN ORE DEPOSITS AT MOUNT BISCHOFF, TASMANIA.

By Baron Von Groddeck, Chief Mining Councillor of the Hartz Mining Districts and Director of the Royal Prussian Academy of Mines at Clausthal, Germany.

*Translated by* G. Thureau, F.G.S., *from the Special Imprint of the Journal of the German Geological Society of* 1884.

*Read September 7th,* 1885.

The Royal Academy of Mines at Clausthal was some time ago placed in possession of a very fine collection of Australian ores. That collection was presented to our Academy by M. Wagenknecht, of Aachen (a Fellow of the Royal Society of Tasmania).

Amongst the samples were found a number of specimens of Tin Ore, together with the rocks and the minerals said to be associated with same, from Mt. Bischoff, Tasmania. The series interested me, particularly on account of a piece of supposed Quartz-Porphyry, which rock, it was represented, is associated (according to the description of S. H. Wintle* and Geo. H. F. Ulrich†) with those Tin Ores, and also because of some peculiar, dense, greyish-blue coloured masses of mineral‡ which most frequently are found to enclose those Tin Ores.

The chemical and microscopical tests gave the unexpected and interesting result, proving this Quartz-Porphyry to be a kind of *Topaz* rock of porphyritic structure, the white or light-coloured portions of same consisting of dense Topaz, whilst the greyish-blue were principally formed of dense Tourmalines.

As this appears to be—so far as I am aware—a totally unknown occurrence of Topazes with Tourmalines carrying Tin Ores, a description of same may be, under the circumstances, justified. As to the value of this discovery, from a geological point of view, I am not able to form an opinion, and such can be only ascertained properly after a careful examination of the several features observable in the respective localities. To initiate and induce such examinations the following may deserve attention:—

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* S. H. Wintle; Stanniferous Deposits of Tasmania. Trans. Royal Society of New South Wales, 1875, vol. ix., page 87.

† Geo. H. F. Ulrich. Written communication; New York Book for Mineralogy, etc., 1877, page 494.

‡ These dense masses of minerals at first led to the belief, from the peculiar structure of same, that they were the results of transmuted Quartz-Porphyries. An analogy certainly exists in the well-known transmutation of Granites, carrying Tin Ores, into "Greisen" or a felspar—less rock. These possibilities gave rise to the now detailed researches; and this paper was read by me at a meeting of the German Geological Society at Hanover in September, 1884. At that time I was not aware of the real character of the supposed Quartz-Porphyry. The special examinations of same were initiated in October of the same year.—V. G.

### 1. PORPHYRITIC TOPAZ ROCK FROM MOUNT BISCHOFF.

This resembles, to a considerable degree, the Quartz-Porphyries, whether such is examined by the naked or unarmed eye or by means of powerful lenses. It consists of a light grey-coloured, dense, hornstone-like base, in which numerous transparent Quartz-crystals can be observed up to 3 mm. in size. One imagines, likewise, of being able to distinguish, in the white coloured cross fractures of this rock, crystals of felspar. It carries also Iron Pyrites in both large and small crystal or in crystalline aggregations.

A preliminary chemical examination showed that, after the removal of the metalliferous ores, the pulverised rock would completely fuse with soda, but that hydro-chloric acid had no effect except the deposition of a white precipitate, composed of Silicious Acid and Alumina. Distinct Fluor reactions were observed with traces of Lime and Magnesia, but alkalis were not present.

The special chemical analysis of this sample of rock, freed from iron pyrites through nitric acid, as carried out by Dr. Sommerlad in the Royal Academy's Laboratories, gave the following results:—

| | |
|---|---|
| Silicious Acid ... ... ... ... | 76·68 |
| Lime ... ... ... ... ... | 1·19 |
| Fluor ... ... ... ... ... | 6·48 |
| Alumina ... ... ... ... ... | 19·99 |
| Magnesia ... ... ... ... ... | Traces |
| Phosphoric Acid ... ... ... ... | Traces |
| Total ... ... | 104·34 |
| Specific Gravity | 3·014 |

Two separate tests were made, according to Rose's method, for ascertaining the percentage of Fluor. The high percentage of Fluor, and the total absence of alkalis, are therefore convincing proofs of this rock not belonging to the Quartz-Porphyries, and that it can now be stated that it consists of, in round numbers, 35 per cent. of Topaz and 65 per cent. of Quartz. To what form the 1·19 per cent. of Lime in this rock can be assigned is not quite clear; but it is quite possible that some very minute crystals of "Titanite"—to be described lower down—contain this Lime. In the same manner, it is doubtful also how the Phosphoric Acid occurs, except with "Apatite." The solution which was obtained by treating the ores with Nitric Acid in order to secure their extraction was found to contain a considerable percentage of

Lime, owing to some Calcites which the microscope had previously discovered.

On placing the pulverised rock into a "Thoulet's" solution of 3·202 specific gravity, the ore was gradually precipitated, and on analysis of that precipitate, the presence of Iron Pyrites was detected with slight traces of Antimony, Copper, and Zinc. The chemical and microscopical examinations which followed established the composition of the rock as follows:—Quartz, Topaz, Iron Pyrites, Calcite, Titanites, and Apatite (?) of which the first two form the leading, and the remainder the less important constituents. The base of the Topaz, as ascertained by analysis, appears, in the microscopic slides under their proper magnifier, as an aggregation of colourless and irregularly formed crystalline grains not above 0·02 min. measurement. Every now and then—especially in the vicinity of the crystals of iron pyrites, the basic Topaz partakes of a more fibrous texture, gaining thereby an appearance which very closely assimilates with the denser whitish Topaz referred to below. The very small crystals, already alluded to, as having been observed in the fractures of the rock itself, sometimes enclose such fibrous Topaz, and they are frequently coated by a whitish mineral, which on account of its granular composition renders the inner or enclosed crystals necessarily less clear, but opaque. It has been impossible for me, at present, to classify these small crystals under any distinct system. It is likewise not possible to declare same as "*pseudo-morphic*" as there are no grounds for such an assumption. On the other hand, they may be accepted as imperfectly formed, minimised crystals of Topaz —*microscopic Pycnite* (*?*)—as composed of very minute fibrous crystals, and that their want of clearness is due to those incrustations. It remains now only to be observed, that within those minute crystals, grains or specks occur, which exhibit vividly coloured polarising colours (also of Topaz) as well as irregularly formed particles of iron pyrites.

The Quartz occurs in the basic mass of the rock in the form of crystalline grains or aggregations from 0·06 to several mins. in measurement. To judge from the very regularly developed form—six sided—of some of these crystals, and their behaviour, when crossing each other's positions, the well-known Dihexadron would most likely be their form under that system, if accompanied by the narrow column sides which are so frequently observed when embedded in Quartz-Porphyries. On magnifying these transparent and polarising crystalline aggregations 400 times their original size, they exhibit frequently those well-known vesicular openings filled with fluids. Fluids, because, they do not appear to consist of carbonic acid, as is sometimes the case, on account of their immobility and I have not, so far, been able to observe any really distinct changes in their position. Various granular and crystalline-foliated minerals could not likewise be defined to satisfaction. Very fine, needle-like crystals occasionally occur, and they may, in all probability, hereafter be recognised as *Apatite*, which would explain the presence of phosphoric acid as shown by the analysis, which acid has not been found in any other form in the rock. The aggregations of iron-pyrites exhibit in the thicker slides under the microscope some very interesting features, as one is enabled to recognise cubes from 0·05 to 0.15 min. in length, edgewise. These crystals are sometimes enclosed for over half their length in quartz crystals, the remaining half being embedded in the basic Topaz. Other very peculiar features are also observable with some very long fibrous forms, measuring from to 0·1 mm. in width by 0.3 to 0.7 m.m. in length, also partly or wholly encrusted by a very thin coating of Calcite. These are very probably lengthened cubes, which have, by some occult means or another, developed in one direction more than in another. These cubes are irregularly formed crystals of iron pyrites, Besides these, there also occur rectangular, nearly cubical, but otherwise irregular crystals of iron pyrites, measuring from 0·35 to 2 mm. in size; impregnated as they are sometimes by crystals of quartz and Calcites; these latter predominate sometimes to such a degree over those sulphurets, which however retain their crystalline form, as to make same quite subordinate so far as proportions or percentage are concerned.

The Calcites occupy various forms and positions within these iron pyrites, and they are confined sometimes by peculiar minute botryoidal and oblong crystals, brownish red in colour, which, from their general appearance, their distinct pleochroism, and the absence of the former fibrous forms, and being accompanied by a very vivid rainbow-like polarism, cannot be mistaken for any other but "*Titanite.*"

The Calcites of this rock, so easily distinguished by their vivid iridescent properties, occur most frequently in the form of impregnations of the iron sulphides, also in distinct, but smaller particles. These crystals of quartz and iron pyrites are evidently of a remoter origin than the basic mass of Topaz. Could it be assumed, for instance, that the latter consisted, whilst in the course of formation, or partook of the gelatinous compound?

### 2. Dense White Topaz of Mt. Bischoff.

This rock exhibits in its peculiar uneven and splintery fractures a trace crystalline.

When heated, in a solution of Cobalt, it turns blue, and gives distinct reactions with Fluor. After roasting, the fact of Hydrofluoric, or Muriatic acids, having no effect is a distinguishing feature.

Dr. Sommerlad's analysis gave the following results:—

| | |
|---|---|
| Silicious Acid ... ... ... ... | 33·34 |
| Aluminous Acid ... ... ... ... | 37·02 |
| Lime ... ... ... ... ... | 0·83 |
| Fluor ... ... ... ... ... | 17·64 |
| Total ... ... | 108·73 |
| Specific Gravity... | 3·456 |

The alterations from the normal composition of Topaz (5 Al Si O5 + Al Si Fl10) are very insignificant, indeed, and they may be attributed to these impurities, the existence of which have been demonstrated when under the microscope, but the percentage of Lime is very remarkable as such cannot belong to the Topaz proper, but is due to other minerals interspersed through the rock. The "slides" of this dense white Topaz exhibit an aggregate of irregularly deposited streaky or oblong groups of needle-like prisms from 0·01 to 0·05 min. in width, to 0·04 to 0·3 min. in length, showing also, across their diameter vivid rainbow-like colours, which, however, disappear entirely with their longer axis. Only very rarely—as quite natural—are the rhombic cross-sections observable in the directions just alluded to. The terminal apices of these prisms resemble those, with crystallized Topaz, customary pyramidal and domatic points.*

To judge from the specimens now before me, dense Topaz, intermixed with dense greyish blue Tourmaline, can easily be discerned with the naked eye, though the latter occurs in forms unlike its usual character, maintaining, however, the ordinary fibrous forms.

Tourmaline is seen distinctly in the "slides," in the form of botryoidal nests and as filling cavities of the Topaz rock.

### 3. TOURMALINE FROM MT. BISCHOFF.

This occurs also in the Carbonates of Iron as needles measuring 0·25 mm. thick, to 1 m. in length, from dark green to blackish colours. "Slides" exhibit the same likewise, as a dirty violet nucleus, which is enveloped by a greenish coating. Their pleochroism is very strongly marked, and the colouring partakes of lighter and stronger tints, according to the manner and position in which the crystals are being held by the observer. These proportionally larger crystals of Tourmaline are gradually developed from a granular and indistinctly radiated mass which appears under the microscope as finely radiated or irregularly fibrous. The mineral in question fuses, under the blow-pipe, with but little effect at the edges and it gives distinct reactions of Boron, and very little of Fluorine.*

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* G. vom Rath has already described Topaz crystals from the Waratah Mine, Mount Bischoff, as from ¼ to ½ min. in size. These crystals formed fine crystalline aggregations in which crystals of Cassiterite were embedded. Also the occurrence of nests of radiating crystals of *Pycnite*. Bonn, 1879.

Dr. Sommerlad has undoubtedly proved, from decimal analysis, that these light greyish blue masses of minerals are Tourmalines.

| | |
|---|---|
| Silicious Acid ... ... ... ... | 36·86 |
| Aluminous Acid ... ... ... ... | 36·72 |
| Boracic Acid ... ... ... ... | 10·56 |
| Peroxyde of Iron ... ... ... ... | 5·66 |
| Peroxyde of Manganese ... ... ... | 0·66 |
| Lime ... ... ... ... ... | 0·34 |
| Magnesia ... ... ... ... ... | 3·92 |
| Kali (Potassium) ... ... ... ... | 1·11 |
| Natrium .. ... ... ... ... | 3·57 |
| Water ... ... ... ... ... | 1·16 |
| Fluor ... ... ... ... ... | 0·61 |
| Total ... ... | 101·17 |
| Specific Gravity ... | 3·042. |

### Closing Remarks.

According to the descriptions given by Messrs. Wintle and Geo. H. F. Ulrich of Mt. Bischoff, it would appear that, on the top of that mountain, there occurs a bold stockwerk-like mass of porphyry which has penetrated a non-fossiliferous, and very probably, very old formation of slate, sandstone and quartzite. These latter exhibit, in the immediate neighbourhood, or, within the contact planes of the porphyries, great irregularities and considerable contortions in the bedding of the strata.

Wintle speaks of tinlodes in this porphyry; according to Ulrich, however, the tin ores occur as impregnations of the porphyry only, and principally so within the planes of contact with the schists. Ulrich reports also that the Waratah Company at the south-eastern flanks of the mountain is engaged in the exploitation of a lode (?) of Quartz-Porphyry carrying tin ore, which intersects independently the adjacent schistose (blue) formation.

It is quite evident, from these descriptions, that the

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* These coarse needle-like aggregations of Tourmaline from Mt. Bischoff have that peculiar appearance, and remind strongly of those of *Zeuxite.*

Quartz-Porphyries at Mt. Bischoff must be considered the "carriers" of tin ores.

The specimen, I have been presented with, and which I have described as closely resembling Quartz-Porphyry, had therefore to be recognised as representing the occurrence of tin ore at that mountain, and therefore as occupying a very important position.

If, however, it has now been unmistakably proved that that specimen is actually not Quartz-Porphyry, but, a *porphyritic Topaz Rock*, then the question arises, whether any such Quartz-Porphyry occurs at Mt. Bischoff *at all*, and whether the whole formation, assumed to be such rock, is very probably a Topaz Rock, and in what manner, and under what conditions the latter occurs contiguously to the real Quartz-Porphyry.

The Topaz Rock, as described, is certainly a very remarkable formation in its character, and it is to my knowledge exceptional in its kind. I have named it Topaz Rock, because of its composition—like the well-known *so-called* Topaz Rock, near Auerbach, in Saxony—of Quartz and Topaz, though there it exhibits not the slightest resemblance in its mode of occurrence to that of Mt. Bischoff.

A probably not unimportant fact, which tends to connect both of these occurrences, otherwise so widely apart, should not, at this stage, be omitted to be mentioned. M. Breithaujet,* it should be borne in mind, has already proved that the Topaz Rock of Auerbach forms, at the surface, a huge well-like mass, which in itself contains or forms an immense lode of Tin Ore.

Topaz, it is well known, is a very frequently and widely disseminated mineral in close conjunction with Tin Ore deposits; but, to our knowledge, such an extraordinarily developed formation as that at Mt. Bischoff in Tasmania is not known to exist elsewhere. The occurrence of Tourmaline there is also very different from any other known in connection with Tin Ore deposits. These two minerals—viz., Topaz and Tourmaline (which are, however, not even mentioned in Messrs. Wintle and Ulrich's descriptions)—in their *dense* forms appear to play a very important and prominent part in the celebrated Tasmanian Tin Ore deposit. It might prove, in all probability, very interesting and valuable to ascertain whether or not such dense—and therefore easily passed over—masses of Tourmaline occur also with other Tin Ore deposits.

A. VON GRODDECK.

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* New Year Book for Mineralogy, 1885, page 788.

# MOSSES OF TASMANIA *(continued)*, TRIBE 2, WEISSIÆ.

### BY R. A. BASTOW.

[*Read October 12th*, 1885.]

It will be understood from the previous papers that the Andreæaceæ and the Sphagnaceæ are so far removed from other mosses as to each form separate sub-orders, the remaining sub-order Bryaceæ containing two Sections, which are again divided into Tribes. Tribe 1, of this sub-order, containing Phascæ and Bruchia, has already been described, and we now notice Tribe 2.

The Weissiæ are a low and tufty growing tribe, with narrow leaves, and are difficult subjects for the tyro to identify. The tribe includes the genera Gymnostomum, Weissia, and Symblepharis; the first of these is distinguished by the total absence of a peristome around the mouth of the capsule; the second, Weissia, bears a peristome of sixteen teeth; and the last, Symblepharis, has eight pairs of bifid teeth at the summit of the capsule. The three genera are similar in their mode of growth, generally not more than half-an-inch in height, and, when dry, the foliage curls and twists around the fruit-stalks, or anything they come in contact with; under an ordinary botanising lens they resemble a multitude of miniature rams' horns. The capsule, with its fruit-stalk, is generally yellowish-green, the rim around the mouth of the capsule being of a decided reddish colour.

The fact that these three genera of mosses are placed in one tribe (Mitten places them in the Tribe Tortulæ), and yet that one of them is gymnostomous, is in conflict with the ordinary view that split-mosses and naked-mouthed mosses are the earliest forms. The affinity of the vegetative systems of the three genera appears too close to strongly support such a view, notwithstanding the entire absence of the peristome in the genus Gymnostomum. Indeed, M. Philibert, in the *Bryological Review*, 1884,* states his belief that the earlier structure is the perfect peristome from which the others have varied by degeneration, and he would have us regard the Encalypta †(extinguisher moss) as the central point whence all the other forms of moss-plants have diverged, all those which have a peristome nearly identical in structure being probably of a common origin; also, that it is difficult on any other theory to account for the almost complete identity of the peristome in *Dicranum, Fissedens, Campylopus, Dicranella, Cynodontium, Trematodon, Dichodontium, and Leucobryum.*

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* Journal, Royal Mic. Soc., Feb. 1885, p. 100.

† Since reading the above paper, I have received from Alfred J. Taylor Esq., some magnificent fruited specimens of the genus Encalypta found by him at the summit of Mount Rumney.

That gymnostomous mosses as well as peristome-bearing mosses existed in the upper Miocene age we have abundant proof. In reply to a request for information on this subject from Baron Von Müller, whose life-long investigations in botanical science constitute him the highest authority in the Southern Hemisphere, he, with his usual courtesy, informs me "that Gæppart found one Phascum in amber; also, in amber, several species of Dicranum, as D. fuscescens, D. flaggillare, D. scoparium, and D. pellucidum; a Hymenostomum, which Schimper finds very similar to H. microstomum; two species of Polytrichum allied to P. urnigerum and P. septentrionale; and a Catherinea allied to C. undulata. Schimper has described a Fontinalis from the upper Miocene formation, and Bragniart another from that geological age. Of Hypnum, several species have been found by Herrs Ettingshauren, Unger, and Saporta in Schists; and Ludwig and Schimper discovered some Hypnums in lignite, in which also some species of Sphagnum occur." After alluding to the special works of the above-mentioned authors, I am particularly referred to Schimper's "Paleontologie Vegetate," a work we unfortunately do not possess in the Library.

It is therefore evident that gymnostomous Sphagnum and Phascum, single-peristomed Dicranum, and the perfectly-developed double-peristomed Hypnum flourished side by side comparatively in the upper Miocene age. Had no Phascum or Sphagnum been in this formation we should have been in a better mood to embrace M. Philibert's view; on the other hand, had no perfectly-developed Hypnum been there found we might have felt a little closer drawn to the old views of development from gymnostomous forms.

Had moss-plants been as large as Sigillaria pachyderma we might have known more of their history, the little we have received creates the want for more. If the perfect double-peristome is the earliest structure, from what allied form can it have varied? Does it not appear more probable that the double-peristome has been developed by slight variations, one small step at a time, through climatic influences, from the single-peristome? May not the single-peristome, in like manner, be developed from the gymnostomous plant; the gymnostomous from the splitting capsule—the latter through leafy, then frondose jungermannia, lichens, fungi, or algæ; and all from the unicellular organism; the primary organism originating from beyond the limit of present discovery?

If, for instance, in a plant of any of the species of three genera comprising the Tribe Weissiæ, after fertilisation of the archegonium, the slightest deviation in the division of the cell by septa should take place, we should most probably have a variation of greater or less significance in the fructification:* it is, therefore, astonishing to note the almost complete immutability of the Natural Law which maintains, for trillions of generations, not only the generic but also the much more minute specific characters of so small a part as is the tooth of a deristome. And if such diverse forms have really been developed from a unicellular organism how vast the intervening period must have been.

### GENUS 5.—GYMNOSTOMUM.

*Beardless Moss.*

The Greek words of which the name of this genus is composed are γυμνος (naked) and στομα (mouth), referring to the naked orifice of the capsule. According to Bridel, this plant is frequently found intermixed with Phascum and Weissia, and has an erect simply-branched stem about half-an-inch high. The capsule is seated on a high and seldom arcuate fruit-stalk; it is small, and loves to be near the habitations of mankind, growing in both barren and cultivated fields amongst grass. It is generally found in tufts, seldom growing solitary. In its fresh state it is a graceful little plant, but cannot be well observed without the aid of a lens. The essential generic characters are the naked mouth and the linear lancet-shaped leaves.

### GENUS 6.—WEISSIA.

This genus was instituted by Hedwig in memory of Weissius, Professor of Botany, Göttingen. The plants are small, tender, and slightly branched; the capsule bears a peristome of sixteen teeth. They must be looked for on moist banks or damp sandy places; they may frequently be found in crevices along with Fissedens, and sometimes on wall tops. The species of this genus present much variation in form, and will sometimes be found very similar to Gymnostomums. The light green tufts have a beautiful cushion-like appearance, hence the English name for W. contraversa — *green-cushioned Weissia.*

### GENUS 7.—SYMBLEPHARIS.

*Wilson.*

This genus is so named by Mr. Wilson because the teeth of the peristome shut close in a cone when dry, the name literally meaning *adhesion of the eyelids.* Bridel names the only species of this genus collected in Tasmania Olomitrium perichætiale; Hooker names it Trichostomum perichætiale in Musc. Exot.; and Griffiths figures it as Didymodon perichætiale. The name Symblepharis is, however, expressive of the appearance of the capsule, and, as we find it in Flor. Tasm. arranged as above, it will be advisable so to accept it here. The perichætal leaves are very long, and, when dry, twist around the fruit-stalk sometimes as high as the capsule.

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* Hofmeister on the higher Cryptogamia.

## TRIBE 3.—FISSEDENTIÆ.

### GENUS 8.—FISSEDENS.

The character of the foliage of this genus at once distinguishes it from any other genus of mosses. It is the little beauty of the whole Natural Order. To make its acquaintances we must explore the very little caves and grottoes to be found n every shaded clayey bank, for the small plume-shaped fronds appear to avoid exposure to the strong light of day, as well as to seek shelter from the passing storm. At this time of the year the minute capsules cast off their lids and expand the bright red peristomes in order to permit the contained spores to mature and escape; in this state they present a charming appearance under a low power of the microscope. The foliage is distichous; this character gives the charm to the plant; indeed observed with a common pocket lens a tuft of Fissedens presents the appearance of a Lilliputian fernery with the addition of richly coloured masses of peristome crowning the gracefully curved fruitstalks.

The African traveller, Mungo Park, has made famous a variety of the first species of this genus, Fissedens bryoides; after being exposed in the sultry parts of that continent to many privations, towards the close of one day the traveller, sad, faint, and weary, sat him down to rest and consider his position; his eye rested upon one small tuft of this moss in the wilderness around him, he gathered it, and as he did so, after a little reflection, he took encouragement therefrom, and banished the fear of a scorching grave in the unknown waste from his mind, the promise of moisture was before him, and in a short time he escaped the danger that had just before appeared so threatening.

One species, F. adiantioides, fruits laterally, and, as its name implies, resembles, on a small scale, a species of Adiantum. The genus at one time belonged to the Dicrani, and if the form of the peristome, which is undoubtedly the Linnæan rule for drawing the generic distinction, be adhered to, it should abide amongst them; but when so great an authority as Mr. Wilson, the author of the Musc. Britt., thinks it wise to employ the characters founded on the difference of foliage, and when other eminent authorities concur therein, we must abide by that arrangement. The peristome is similar in both genera, but the leaves of Fissedens are distichous, whilst those of Dicranum are inserted on all sides of the stem. The teeth of the peristome are bifid, and the divided limbs are usually bent back in the form of a flesh-hook: hence the original name of the genus Dicranum.

## TRIBE 4.—LEUCOBRYACEÆ.

### GENUS 9.—LEUCOBRYUM.

### *White Fork-Moss.*

Hedwig placed this moss amongst the Dicrani as the teeth of the peristome were similar, but the pale and sometimes bluish grey colour and cellular structure of the foliage sufficiently distinguish it from the Dicrani. Müller has consequently placed it in the Leucobryaceæ, and he states that in viewing the leaves at an acute angle the prismatic colours are seen. It grows in moist ground, on heaths, in bogs, at the roots of trees, and on decaying wood.

## TRIBE 5.—DICRANACEÆ.

### GENUS 10.—DICRANUM, *Hedwig.*

### *Fork-Moss.*

The peristome of Dicranum is similar to that of the two preceding genera, and at that point the similarity ceases. The stems of the plants of this genus are erect and branched, they grow vigorously in company with Bryum and Polytrichum, the leaves are generally bent to one side (secund), they are narrow and numerous, and usually have a fine narrow nerve to the apex of the leaf. The capsules are seated on high fruit-stalks, are frequently plentiful, they are cernuous, and sometimes erect. The lid of the capsule is furnished with a long beak, bent somewhat to the shape of a shoemaker's awl. They may be found on mountains and in valleys, in woods, fields, and almost everywhere, except in water. They usually grow in large tufts, and are frequent on old logs in the bush around Hobart. The fruiterers of the city generally have a good supply of Dicranum in their windows; it may be easily distinguished from other mosses by its long bristly bundles of leaves, which have somewhat the appearance of miniature horse-tails.

The accompanying photograph will convey a correct idea of the usual form of Dicranum capsule, also of the bifid apices of the teeth of the peristome. These photographs have been taken by the microscope with a 1½in. objective, a small camera without the lens, and an ordinary microscopic lamp.

# EARTHQUAKE PHENOMENA IN TASMANIA.

By Capt. Shortt, R.N. (Meteorological Observer.)

[*Read November* 16, 1885.]

Since last November when I read a former paper on earthquake shocks and tremors, and up to the present time there has been a considerable decrease both in the number and intensity of the shocks, excepting that of May 13th.

From the table annexed with this paper, giving the time of occurrence, it will be observed, that at Gabo the shock is felt earlier than in Tasmania, also shocks have been felt farther inland on the continent of Australia, showing that the centre of disturbance during the past year, is to the north of the centre, marked in the Coloured Map, produced in my previous paper. The disturbance has been felt very severely at the Kent Group Lighthouse about a dozen panes of glass have been broken from the commencement.

To strengthen the position I have taken in fixing the probable centre of disturbance. I will introduce the views of Professor Milne, of Japan, who recently visited Victoria and Tasmania, and published an article in the Melbourne *Argus* on the earth movements in Australia. He is undoubtedly a great authority on Seismology, on account of Japan being always more or less in a state of disquietude from shocks and tremors, and his having had charge of the Seismological Department for some ten years, making a study of the Volcanic Phenomena, and his investigations have not been confined to actual disturbances, but also by experiments with dynamite discharges in the earth at various depths, by which he has gained much knowledge as to the rate of progression of shocks through different strata.

The following are his conclusions on the disturbance affecting us:—"From the various investigations which have been made, it appears that there is a line of weakness in the earth's crust running parallel to the eastern coast of Tasmania. From time to time, whilst sinking to a state of equilibrium, this line gives way, first at one point and then at another. Each of these movements is announced as a series of tremors which now and then may be accompanied by one or more violent lurches. If this is a correct view to take, then, in a few years, it is possible that actual stability may be reached, and the earthquakes of Tasmania and Victoria become tradition of the past.

"A second view is that the disturbances are directly connected with the capillary intrusion of sea-water to volcanic foci, consequent on which there are explosions and ruptures along the above-mentioned line of weakness. Be it as it may, it is certainly remarkable that the greater number of earthquakes in the world occur in volcanic countries, but not actually at volcanoes. They usually originate on or near the foot of a slope beneath deep water. Eighty per cent. of the earthquakes in Japan have such an origin. The great earthquakes of South America, which are sometimes propagated to the shores of this colony as a series of sea waves, originate beneath the deep water off the western coast of that continent. Many of the earthquakes of New Zealand have originated beneath the ocean at the entrance to Cook's Straits.

"Lastly, we have the earthquakes which have so recently been felt in Melbourne, probably originating, as pointed out by Captain Shortt, near to the edge of the 2,000 fathom line off the north east shore of Tasmania."

### REPORTS ON THE EARTHQUAKE SHOCKS, 1885.

January 1.—Barque Free Trader at sea, when 80 miles to the Eastward of Flinders Island, experienced a severe shock at 2 p.m., duration about 10 seconds.

January 31.—The Superintendent of Swan Island Light House reports that a shock was felt at 12h. 36m. a.m. The Light House appeared to rock, and everything seemed to be on the move for several seconds.

February 27.—9h. 35m. p.m. at Swan Island, severe shock, was reported as remarkable, as during several seconds, the iron roof on Superintendent's dwelling house sounded as if it was tearing in all directions, but no damage was sustained.

March 21. and 30.—Medium strong.

May 13.—This shock was the heaviest experienced since September 19, 1884, and the great distance the shock was felt from the centre of disturbance shows it to be as strong as the very severe one of July 13th last year. Extending to Corrina to the Westward, Melbourne N. W.; and to the North to Candello, which is 258 miles South of Sydney. It was felt severely at Hobart and Launceston. Vessels lying alongside the wharves at Hobart were surging backwards and forwards, as if there was a ground swell moving the ships.

Also at Sandridge the effect on the shipping was most noticeable.

Mr. J. R. Hurst, of Moorina, in describing the shock, states that he saw cats and dogs flying about the yard, in great alarm, and a mob of cattle grazing in a paddock in the same state; dead standing trees in the clearing were moving about in nearly a North and South direction, and small branches falling from them, wave-like motions were observed upon the earth under foot.

July 17.—Strong shock, loud and long rumblings at Moorina.

August 7.—At 8 p.m. barque Kassa experienced sharp shock of earthquake when 30 miles East of Cape Barren Island.

September 11.—The strongest since the 13th of May.

Before concluding I beg to thank Mr. R. M. Johnston, and Mr. J. Clunies Ross, for the assistance I have received from them in acquiring knowledge of earthquake phenomena, as it comes more under the province of Geologists, than Meteorologists. The Secretary of the Meteorological Society, London, in acknowledging receiving my previous paper on shocks and tremors, remarked that the Phenomena has not been recognised to have any connection with the Weather and Meteorology.

I also wish to make acknowledgments, and return my thanks to those observers who have rendered me assistance in furnishing records of shocks that have come under their notice.

### TABLE OF THE SEVEREST SHOCKS, NOVEMBER, 1884 TO NOVEMBER, 1885.

TIME OF SHOCKS ON THE CONTINENT CORRECTED TO HOBART TIME. A.=A.M., P.=P.M.

| Month. | Date. | Hobart. | Launceston. | Moorina. | Falmouth. | Corinna. | Gabo Isl'd. | Wilson's Promontory | 218 miles N of Sydney, Candello. |
|---|---|---|---|---|---|---|---|---|---|
| 1884.<br>Dec. | 20 | — | — | 7·8 P | — | — | 7·5 P | — | — |
| 1885.<br>January | 31 | 12·55 A | 12·53 A | 12·57 A | — | — | 12·50 A | — | — |
| February | 27 | 9·50 P | 9·40 P | — | — | — | 9·45 P | — | — |
| March | 21 | 9·13 A | 9.11 A | 9·7 A | 9·20 A | — | 9·10 A | 9·20 A | — |
| March | 30 | — | — | 9·13 P | 9·15 P | — | 9·10 P | — | — |
| May | 13 | 9·38 A | 9·37 A | 9·39 A | 9·40 A | 9·45 A | 9·35 A | 9·37 A | 9·45 A |
| July | 17 | 8·38 A | 8·35 A | 8·32 A | 8·35 A | — | — | — | — |
| Sept. | 11 | 7·19 P | 7·20 P | 7·17 P | 7·25 P | — | — | — | — |

# NOTES ON BORING OPERATIONS IN SEARCH OF COAL IN TASMANIA, 1884. (*Continued.*)

By T. STEPHENS, M.A., F.G.S.

[*Read November* 16, 1885.]

In continuation of the short paper read last year on the works then in operation at Cascades, Hobart, and at Tarleton, I now lay before the Society the records of boring with the diamond drills, together with a few remarks on the results. I have, on several occasions, pointed out the extreme improbability of the discovery of coal in either locality, but there were many who held a different opinion, and it was well that the question should be set at rest

The work at the Cascades was much impeded by the "jointy" character of the rock, which from the surface downwards showed unmistakeable signs of disturbance, such as might be expected from the presence of great faults crossing the valley on both sides and from the proximity of eruptive rocks. Circumstances prevented me from visiting the place from the beginning of March until after the works had been stopped, but I was informed from time to time of what was being done. In the month of August I was informed that the drill had struck "granite," and a glance at a core, sent to me by order of the Minister of Lands, enabled me to report that the trap rock had been reached, and that further exploration was useless. After the stoppage of the work I ascertained, by inquiry and by examination of the cores which had been preserved, that the igneous rock, which is the common diabase or "greenstone" of the neighbourhood, had been first struck by the drill between 509 and 519ft. from the surface, and had therefore been penetrated to a depth of about 100ft. before its true character was recognised. That it is here an intrusive rock, and therefore newer than the Upper Palæozoic beds, which are in contact with and partly overlie it, I have no doubt at all; the superficial evidence of local disturbance, the joints and fissures filled in with calcite and pyrites, the alteration noticeable in various bands, which differs according to their lithological character, and is in exact conformity with that which is always associated with the presence of intrusive rocks, point unmistakeably to this conclusion. I regret to find that on this point I am compelled to disagree entirely with my friend, Mr. Johnston, who, in a paper recently read before the Society, cites this as an instance of the priority of the igneous rock to the sedimentary beds with which it is associated.

The records of the boring at Tarleton call for little remark. The coal measures proper were found to continue to a depth of a little over 200ft. below the seam of coal, being succeeded by Upper Palæozoic marine beds apparently conformable to them and reaching to a further depth of 105ft., where, at 370ft. 6in. from the surface, the Silurian limestone easily recognisable by anyone acquainted with the district was struck, and the question of the existence of another seam of coal definitely settled there at least. It may be well to note the circumstance of the absence from the records of any mention of the marine beds usually found overlying the Mersey coal seam. These beds, as was first pointed out by Mr. Hainsworth, are never found nearer the coal than 50ft., and, therefore, would not be met with in a section which begins only 41ft. 9in. above the seam.

In my former notes on this subject I gave a brief sketch of the possible relations of the coal measures of Tasmania to those of New South Wales, in which I ought, perhaps, to have pointed out that the presence of *Gangamopteris* in the Mersey beds suggests a comparison with the Bacchus Marsh sandstone, and that the *Thinnfeldia* and *Equisetaceæ* of the upper coal measures of Tasmania indicate some relationship between them and the Wianamatta beds of New South Wales, or even the upper coal measures of Victoria and Queensland. Until, however, the order of succession and the continuity of our own rock system has been more thoroughly investigated and determined, and the fossil *fauna* and *flora* of its various formations more fully identified and described, there will be no sufficient basis for any satisfactory geological comparison; and this defect will not be adequately remedied until the Geological Survey of Tasmania is again taken in hand.

# ABSTRACT OF RECORDS OF BORING IN UPPER PALÆOZOIC BEDS AT CASCADES, HOBART, 1884.

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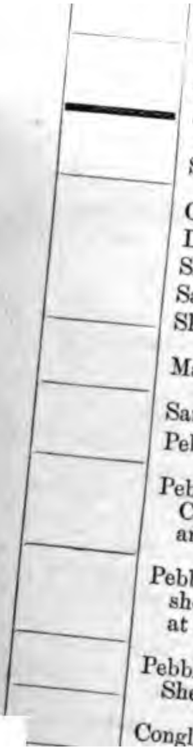
| DESCRIPTION OF ROCK. | DEPTH IN FEET. |
|---|---|
| Surface soil, about 2ft., and limestone, full of joints, with conglomerate band 3ft. thick at 13ft. 6in.... | 32·11 |
| Limestone and mudstone, changing from hard and brittle to soft, latterly very hard ... ... ... ... | 125 |
| Limestone and mudstone, at 151ft. very changeable from hard to soft for 5ft.; very hard bar of limestone 22in. thick at 161ft. 6in. ... ... ... ... | 180·7 |
| Very changeable, soft soapy band 1ft. thick at 200ft. | 202 |
| A few fossils, very changeable; last 10ft. full of veins of pyrites ... ... ... ... ... | 255·3 |
| Full of pyrites; struck water at 265ft.; country latterly more regular ... ... ... ... | 298·10 |
| Country changeable, much pyrites, fossils rare; water, 300gals. per hour, and getting stronger... | 336·6 |
| Changeable; much jointy rock, bad to bore; hard limestone at 356ft. ... ... ... ... ... ... | 358 |
| Hard and brittle; fossils at about 370ft.; finished in soft limestone ... ... ... ... ... | 384 |
| Hard and regular, changing to brittle, and then soft band full of pyrites... ... ... ... ... ... | 428 |
| Hard and brittle; 3ft. of fossils at 448ft. ... ... | 458·9 |
| Very hard and brittle; no fossils last 15ft. ... ... | 488 |
| Very hard; at 496ft. went through 5ft. 6in. of marble; left off in dark grey stone without fossils showing; water about 700gals. per hour ... | 519 |
| * * * * * * * | * |
| Total depth ... ... | 612·1 |

* [NOTE.—The remaining portion of the records, which were evidently written under a misconception as to the nature of the rock passed through, is omitted. The "dark grey stone without fossils," which is subsequently described as "limestone," is a fine grained crystalline diabase passing in the ordinary way into a coarser variety noted as "very coarse rock like granite." This rock must have been struck between 509 and 519 feet from the surface.]



Sandstone ... ..

Conglomerate and
Shale ... ...
Coal... ... ...

Sandstone ... ...

Conglomerate ...
Dark Sandstone ...
Shale ... ...
Sandstone ... ...
Shale ... ...

Marl ... ...

Sandstone ... ...
Pebbly Marl ...

Pebbly Marl, with thin
Carbonaceous Matte
and 182 feet ...

Pebbly Marl, with S
showing Carbonaceou
at 265 feet ...

Pebbly Sandstone, with
Shells ... ... .

Conglomerate with

# AUSTRALIAN TOPOGRAPHY: EDEL'S LAND, DE WITT'S LAND, AND CARPENTARIA.

By James R. McClymont, M.A., Edin.

[*Read November* 16, 1885.]

In the Letter of Instructions issued to Tasman in 1644, as edited by Mr. Swart in the *Verhandelingen en Berigten betrekkelijk het Zeewezen,* Jaargang 1844, bl. 65, occurs the following reference to an early Dutch expedition for the fuller discovery of New Guinea and the unknown south land:—

"De tweede voyagie met seecker jacht, in den jare 1617, onder 't berleyt van den fiscael D'Edel, met weynich vrucht gedaen, van welck bejegeningh en ondervindingh tegenwoordich (mits't verlies van de journaele aenteyckeningen) geen seeckere contschap te vinden is."

"The second voyage in a certain yacht in 1617, under command of the Fiscal D'Edel, was attended with meagre results, concerning which undertaking and discovery no certain account can now be found, in consequence of the loss of the journals and observations."

A comparison of this passage with others in the same Letter and with the maps of Tasman and Visscher and the Stadhuys map, leads to the opinion that the Edel's Land of western Australia was approximately the goal of this voyage, and that the date 1619, generally ascribed to its discovery, should be regarded as that of a subsequent visit. (*Harris' Voyages ed. Campbell. i, p* 325.

In support of this opinion, it will be remembered that a discovery of land far south of the turning-point of the *Duyffken* was reported in Java towards the end of 1616 on the arrival of the outward-bound ship *Eendracht,* and that a lively interest was awakened in the minds of the Dutch authorities by the news of this and subsequent glimpses of the western coast of the new south land. This is evident from the fact that in September 1622, the then Governor-General, Jan Pietersz Coen, authorised an expedition for the express purpose of reporting upon this and other chance discoveries, and equipped thereto the yachts *Haeringh* and *Hasewindt.* It may be presumed that this expedition, six years after the discovery of the *Eendracht,* was not the first attempt made to authenticate the same by an official survey, for the discovery was important to the Dutch East India Company from a commercial point of view, since the crews of their outward-bound ships frequently fell a prey to sickness and scurvy about the time of their reaching these latitudes, for whose relief Gerrit Pool was enjoined in 1636 to find a con-

in a connected sketch, the
Holland, and the adjacent
*Tas.* 1884, p. 262.) (2) a m
Jacobsz Visscher, Tasman's
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***divers voyages,*** 1re partie, 16

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**date of its discovery. Tasm**
**extending from about lat. 3**
**which on the landward side**
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**part of the coast-line several d**
**this map Edel's Land extend**
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**curate in his lettering, and i**
**places a legend at a part of**
**map shows to have been**
**of that map we assign the**
**visit of 1619. Turning now**
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***discovered Anno*** **1628.'**
**not. as**

been made to him. In default of any such reference, we may suppose that his name had become associated with the coast between the Lands of the *Eendracht* and of the *Leeuwin* in consequence of an earlier voyage to those parts, and that the designation, 'D'Edel's Land,' was extended to fresh discoveries in the same region out of compliment to him as its first visitor.

*De Witt's Land.*—Reverting to the text of the Instructions, we find the following account of the discovery of De Witt's Land.

"In't volgende jaer 1628, 't selve lant aen de noortcant by 't schip Diana (varende uyt *Indiae* na Nederland) op de zuyderbreete van 21 graden onverwacht ontdect, en omtrent 50 mylen custs beseylt is."

"In the following year, 1628, the same land was unexpectedly discovered on the north side in lat. 21° S. by the ship *Diana* (bound from the Indies to Holland), which vessel sailed along the coast for about 200 miles."

The name *G.F. de Witte-lant* is borne by this coast, and the discovery seems to have comprized about one hundred miles on either side of the present N. W. Cape of Australia. Strangely enough, the Instructions as edited by Dalrymple (*Collection of Memoirs concerning the Land of Papua*) give the name of the discovery-ship as the *Vianen.* In default of a reference to the original MSS, we can only set the one authority against the other. The probability however is in favour of the goddess, whose name is naturalised in Dutch, while the word "Vianen" belongs neither to that, nor, so far as I know, to any other language.

*Carpentaria.*—The publication of Tasman's map confirms the opinion that the Gulf of Carpentaria was first coasted in its entirety by Tasman in his second voyage. His track, anchorages, and soundings are marked with great minuteness. The name "Carpentaria," however, does not appear, and we may conclude that it was one of those latinised names introduced for the first time in the original of the map published by Thévenot, where it appears on the land oast of the gulf. *Vide Major's Early Voyages to Terra Australis.* pp. xcix.-ciii. It is interesting to note that Carpenter's name is appropriated to a river on the east side of the gulf in about lat. 13' S. by the draughtsman of Tasman's map,—probably a survival from one of the early expeditions for the exploration of what was then regarded by the Dutch as the west coast of New Guinea.

I cannot conclude these fragmentary notes without acknowledging my indebtedness to Mr. Justin Browne and Mr. J. B. Walker for their kind loan of books during their preparation. But I would insist on the fact that private collections

PLATE I.

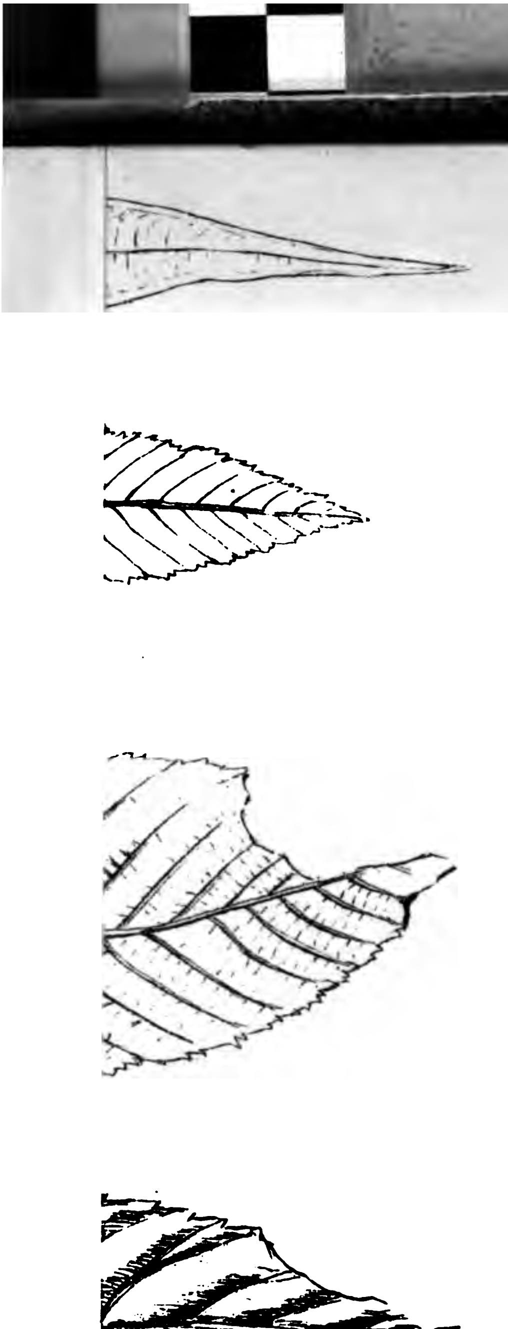

PLATE I.

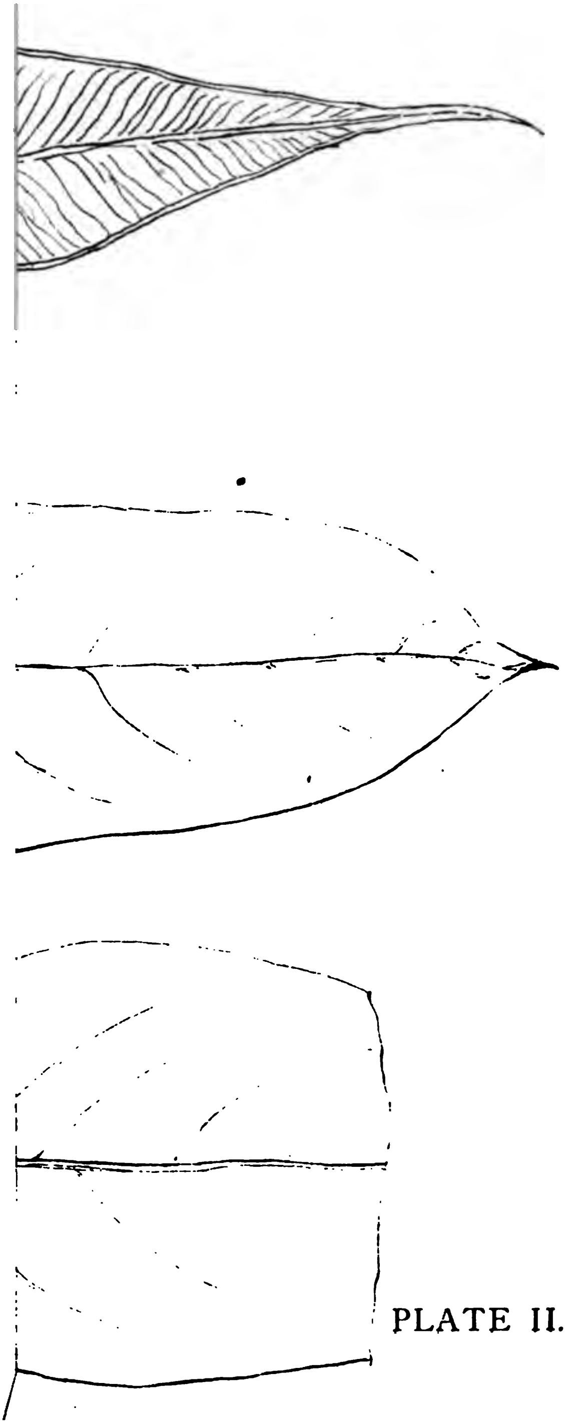

PLATE II.

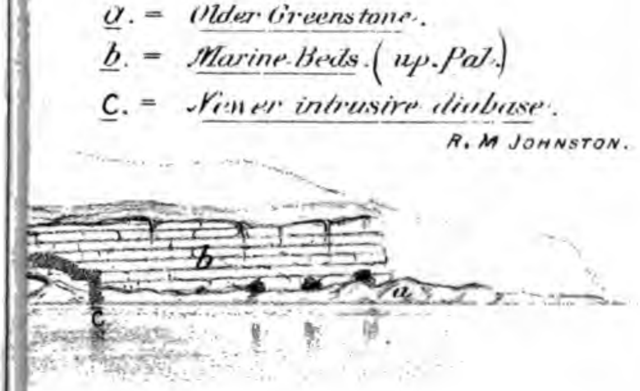
a. = Older Greenstone.
b. = Marine Beds. (up. Pal.)
c. = Newer intrusive diabase.
R. M JOHNSTON.
b
a
c

PLATE III.

|  |  |  |  |  |
|---|---|---|---|---|
|  | M! Lamont Range;<br>Gympie and Rockhampton beds<br>Cracow Creek .<br>Bowen River .<br>Don River . | formation | Talchir. –<br>Karbari Beds | Limestone Series |
| r |  | Kaikoura<br>Waihao<br>Wanaka<br>formation |  | Devonian<br>Upper<br>Middle<br>Lower |
| n<br>'<br>lik<br>r, |  | Upper Silurian | Silurian<br>Obolus Beds<br>Bhabch series | Silurian<br>Upper<br>Ludlow group<br>Wenlock .<br>Upper Llandovery . |
| l |  | Lower Silurian<br>M! Arthur series |  | Lower<br>Lower Llandovery group.<br>Caradoc & Bala<br>Llandeilo<br>Arenig |
|  |  |  | Infra Silurian | Cambrian<br>Upper { Tremadoc slates<br>Lingula flags<br>Lower { Menevian group<br>Harlech group |
|  | Archaean | Archaean | Archaean | Archaean or<br>Pre . Cambrian |

Hobart